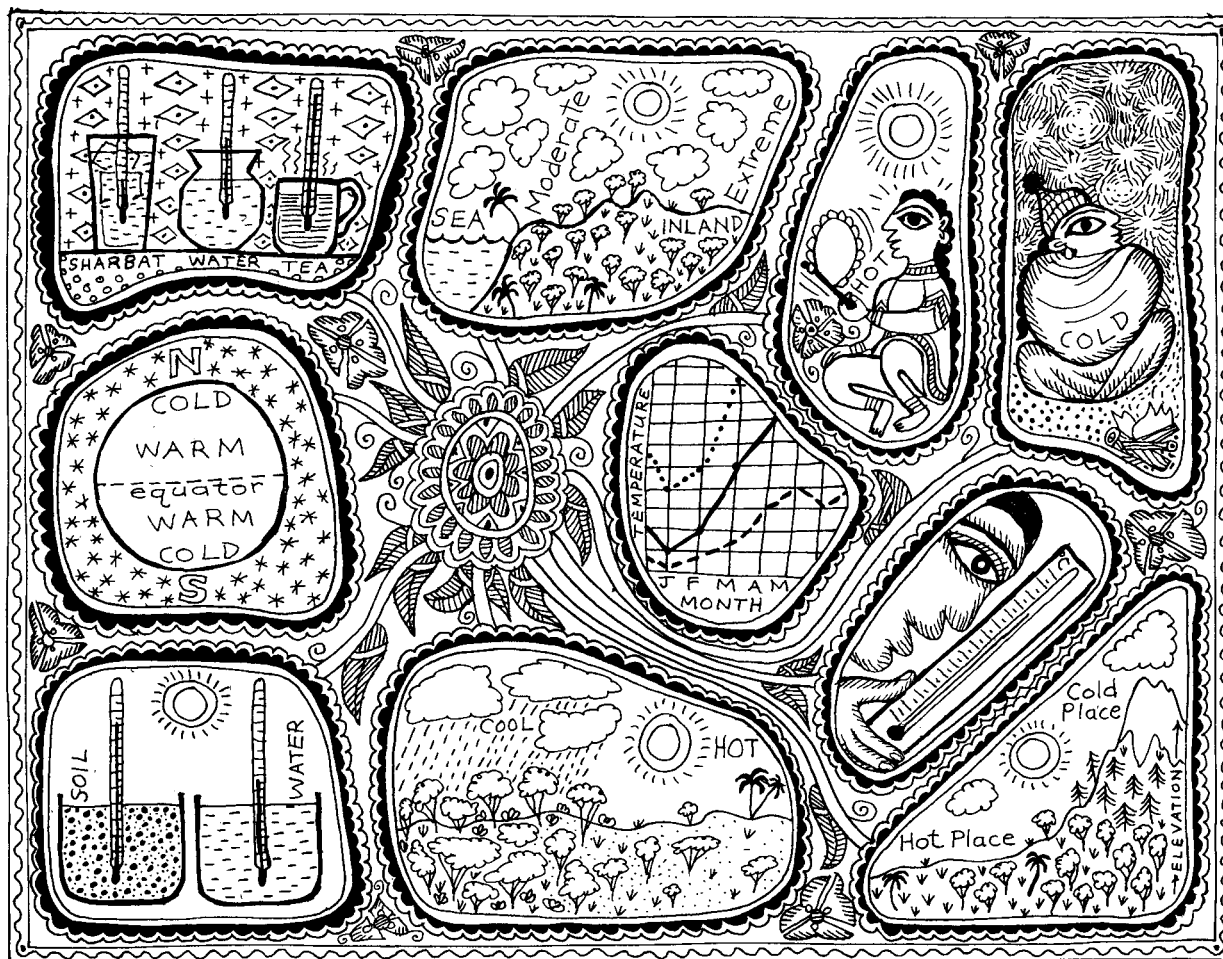


# GEOGRAPHY OF INDIA





We often talk about how hot it is or how cold it is. Some days are hotter than other days.

*Try to remember times when it was very hot, and other times when it was very cold. Write down whatever you remember about those times. Note where you were, what you did, etc.*

Heat has a lot of effect on us, and on all living things.

You must already know that some places get hotter than other places. Some parts of India get very hot, and some parts get very cold. Some places on the earth are always quite cold. Some places are usually hot. And some places remain neither very hot, nor very cold.

How do we measure how hot a place is? Let's find out.

# Measuring Our Body Temperature

Sometimes when we fall ill we get a fever. That means our body is warmer than usual - its temperature has increased. A thermometer can be used to find out how high a fever is.

A thermometer is a small glass tube filled with a liquid like mercury or coloured alcohol. The liquid expands when it is heated.

The scale is marked on the side of the tube.

When we put the end of the thermometer inside our mouth, the liquid gets heated by the heat of our body and expands. It goes far up inside the glass tube. When it reaches the temperature of our body, it stops expanding.

The point on the scale where the liquid comes to a stop shows us our body temperature.

Just as we have two different units for measuring distance (kilometres or miles), we have two different units for measuring temperature: degrees Celsius ( $^{\circ}\text{C}$ ) or degrees Fahrenheit ( $^{\circ}\text{F}$ ). The little circle ( $^{\circ}$ ) means 'degrees'.

The thermometers that are used to tell our body temperature usually have units of Fahrenheit. A healthy person's body has a temperature of about 98.6 degrees Fahrenheit ( $98.6^{\circ}\text{F}$ ). If we measure in units of Celsius, this is 37 degrees Celsius ( $37^{\circ}\text{C}$ ).

*How do you find out your body temperature with a thermometer?*

## N BEWARE! N

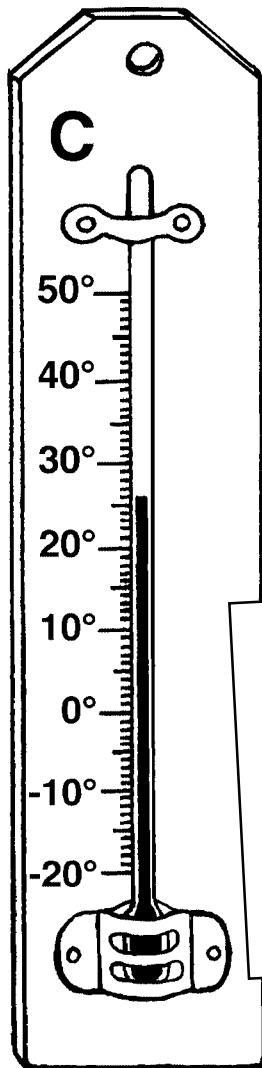
Mercury is a very poisonous metal. It is a liquid at room temperature. **You should never touch mercury.** Even the invisible, odourless fumes that mercury gives off are dangerous to breathe. In case you break a mercury thermometer, you should let an adult carefully scoop up the mercury onto a piece of paper without touching it and bury it somewhere safe.

Try to get thermometers that are filled with coloured alcohol instead of mercury, since they are safer. The alcohol is usually coloured red.

## The Temperature of Air

Just as we can measure our body's temperature, we can also measure the temperature of air. But for this a different kind of thermometer is used, and its scale is usually in Celsius units (as shown on the right).

*Bring a Celsius thermometer to the classroom. Note what temperature the thermometer shows. This is the present temperature of air in your classroom.*



## The Meteorological Department

This is a department of the government that has its offices in many different parts of the country. Each office records the daily temperatures. All the countries of the world have such weather bureaus recording the temperatures of various places. Thus, we can get information about the temperatures of numerous places all over the world, for every day, every month and every year.

Official temperatures are measured at a distance of 1.6 metres above the ground under a structure that provides shade from the sun and exposure to air, and is away from any walls that might radiate heat.

**Note:** Always measure the air temperature in the shade, not in the sun. Keeping a thermometer in the sun may cause it to rise to a temperature that is much higher than the air temperature – the thermometer might even break!

*For the next week, measure the air temperature each day at the same time and place. (Remember to choose a place that is in the shade.) Each day before you measure, write down your guess. Keep your record in a separate notebook.*

**Place** \_\_\_\_\_

**Time** \_\_\_\_\_

**Month** \_\_\_\_\_

*To get an idea of other temperatures, measure and note the temperature of the following things. Before you start measuring, guess the temperature of each one.*

Thing	Temperature	
	Guess	Measurement
A bucket of water		
Water in a matka		
Ice		
A glass of cold water		
Warm bath water		

*It is safer and advisable to use thermometers that have a scale of  $-10^{\circ}\text{C}$  to  $110^{\circ}\text{C}$ . Using such a thermometer, also measure and note the temperature of boiling water and hot tea.*

Date	Air Temperature	
	Guess	Measurement

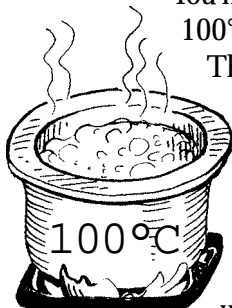
If you measure the temperature for a week in different months throughout the year, you will be able to see the temperature differences that occur between the summer, winter, monsoon, and other seasons.

*Record the temperature every day for one week for a few different months.*

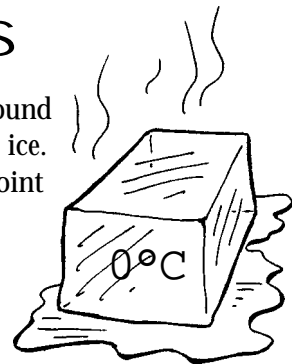
*Calculate the average temperature for each week that you make measurements.*

*Discuss the variations between different weeks.*

# High and Low Temperatures



You must already know that when water reaches a temperature around  $100^{\circ}\text{C}$  it starts boiling, and at about zero ( $0^{\circ}\text{C}$ ) it freezes into ice. That's why these temperatures are known as the boiling point and the freezing point.



There is no place on the earth where the air temperature gets 'boiling hot'. It never reaches  $100^{\circ}\text{C}$ . But there are many places where the air temperature has reached  $0^{\circ}\text{C}$  and even lower. Do you know how temperatures are written when they are lower than  $0^{\circ}\text{C}$ ? They are written by writing a negative sign (-) in front of the temperature.

Let's say that the temperature of a certain place is  $5^{\circ}\text{C}$  below 0. Then we'll say it's minus five degrees Celsius ( $-5^{\circ}\text{C}$ ).

-5 -4 -3 -2 -1 0 1 2 3 4 5 6 7 8

Fill in the blank under each of the following thermometers to tell what temperature it shows.

*Which temperature is greater:  $5^{\circ}\text{C}$  or  $-5^{\circ}\text{C}$ ?*

*At which of these two temperatures will we feel colder?*

*How many degrees difference is there between  $-5^{\circ}$  and  $5^{\circ}$ ?*

*Write in short form each of the following temperatures:*

*88 degrees below zero, Celsius*

*38 degrees above freezing, Celsius*

*32 degrees below freezing, Celsius*

*Did you note the temperature in your classroom today? 88 degrees below zero Celsius is how many degrees lower than the temperature you measured?*

*The temperature of a normal human body is  $37^{\circ}\text{C}$ . Therefore  $50^{\circ}\text{C}$  is how much hotter than normal body temperature?*

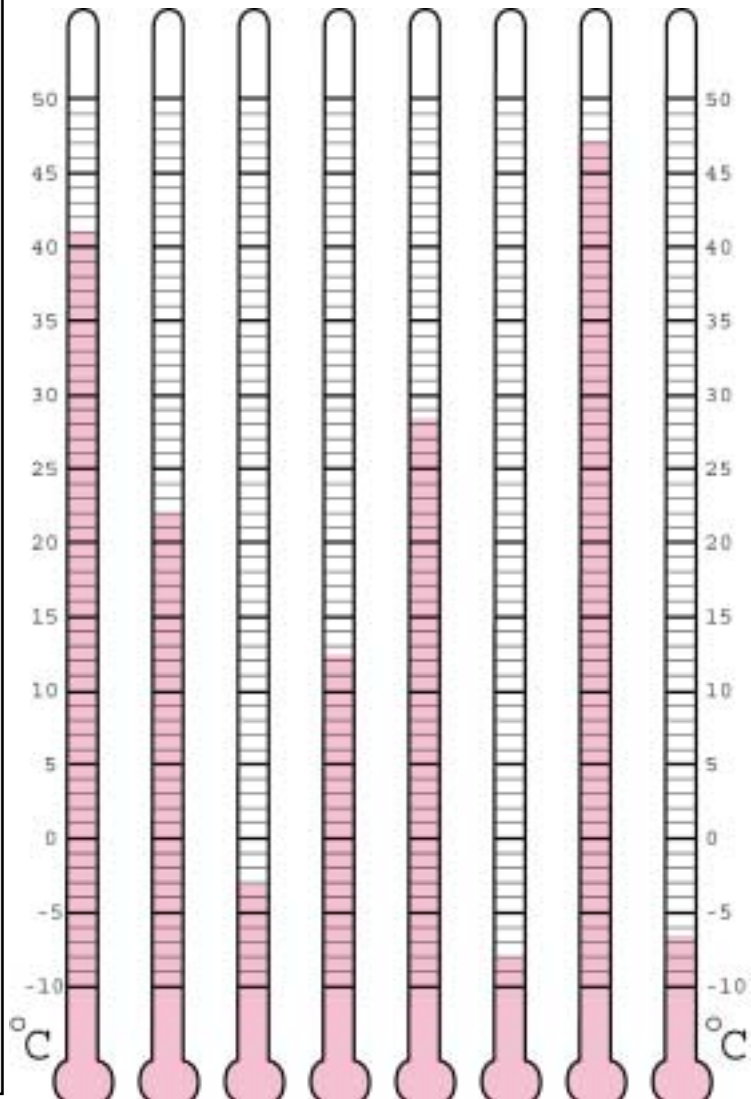
*How much colder than the normal body temperature is  $-5^{\circ}\text{C}$ ?*

*Arrange the following temperatures in order from the highest to the lowest:*

*$12^{\circ}\text{C}$ ,  $-16^{\circ}\text{C}$ ,  $29^{\circ}\text{C}$ ,  $0^{\circ}\text{C}$ ,  $-4^{\circ}\text{C}$*

*At which of the above temperatures will we feel hottest?*

*At which of the above temperature will we feel coldest?*



# Extreme Temperatures

Sometimes it gets extremely hot or extremely cold. Table 1 shows some of the lowest (minimum) air temperatures that have ever been recorded in various places. Table 2 shows some of the highest (maximum) air temperatures.

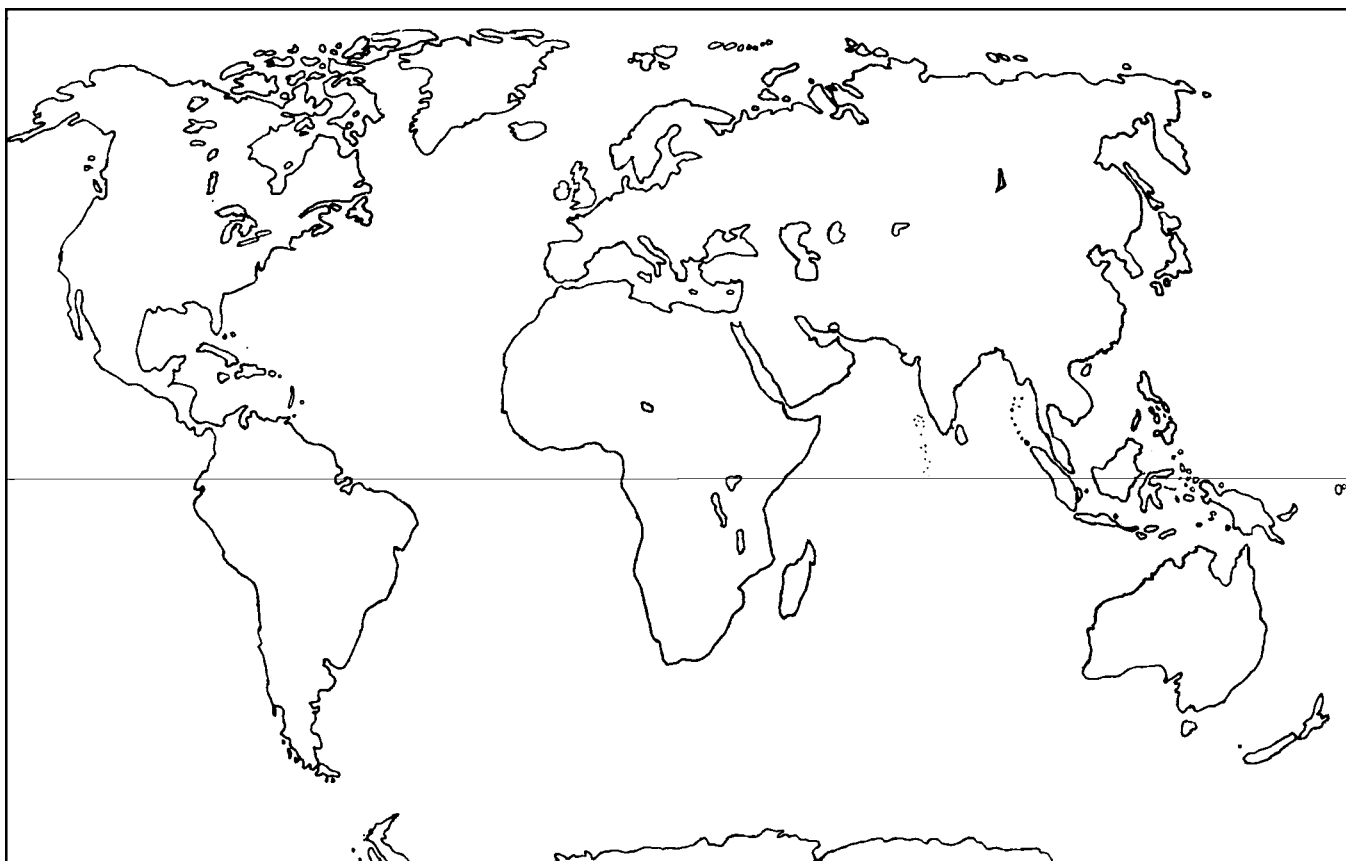
**Table 1: Cold Extremes**

Place	Date	Temperature
Vostok Station, Antarctica	21 July 1983	-89.2°C
Oimyakon, Siberia, Russia	6 Feb 1933	-68°C
Northice, Greenland	9 Jan 1954	-66°C
Snag, Yukon, Canada	3 Feb 1947	-63°C
Prospect Creek, Alaska, USA	23 Jan 1971	-62°C
Charlotte Pass, New S.Wales, Australia	29 June 1994	-22°C

**Table 2: Hot Extremes**

Place	Date	Temperature
Azizia (Al Aziziyah), Libya	13 Sept 1922	57.8°C
Death Valley, California, USA	10 July 1913	56.7°C
Tirat Tsvi, Israel	21 June 1942	54°C
Pad Idan, Pakistan	23 May 2002	50.6°C
Cloncurry, Queensland, Australia	16 Jan 1889	53°C
Seville, Spain	4 Aug 1881	50°C

*Use your Atlas to find the locations of the places in Tables 1 and 2. Mark their (approximate) positions on the following map. Mark the coldest places in blue and the hottest places in red.*







Scientists use special snow tractors to pull sleds carrying the equipment they need to do experiments at the Indian research station in Antarctica.

*In which parts of the earth are these very hot and very cold places in Tables 1 and 2 located? Use your Atlas to tell whether any of them are in each of the following parts of the earth (the first one is done for you):*

Parts of the earth	Cold extremes	Hot extremes
a) Areas near the South Pole	yes	no
b) Areas near the Equator		
c) Areas near the North Pole		
d) Hot deserts		
f) Tropical rain forests		

## The Temperature Keeps Changing Throughout the Day

The temperature rises and falls during the day. So much variation can take place in the temperature from the morning to the evening and then the night! In some places the temperature can change by more than 20 or 30°C in one day!

*Based on your past experience, when do you think are the hottest and coldest times of day or night?*

Can the students in your class take on the job of measuring the outdoor temperature (in the shade) every hour or every two hours for 24 hours in one day? How could you do it? If you can do it, you can get an idea of how the temperature changes throughout one day. You could then find out what was the maximum (highest) temperature and what time of day it occurred. You could also find out the minimum (lowest) temperature and when was the coldest time of the day.

Of course, the temperatures will be different in different places and at different times of the year.

Maybe the time of the maximum and minimum temperature will also vary.

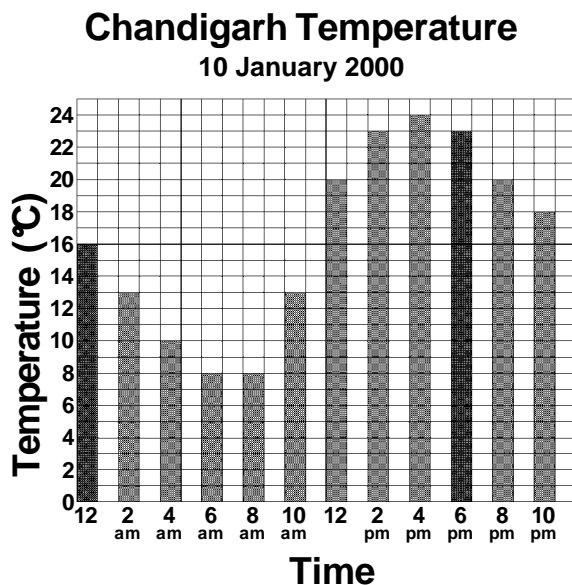
Here is a chart that shows the temperature that was measured every two hours on 10, January 2000 in Chandigarh. (The weather was partly cloudy, with no rain. The sunrise was at 7:21 am and the sunset was at 5:39 pm.)

### Chandigarh Temperatures 10 January 2000

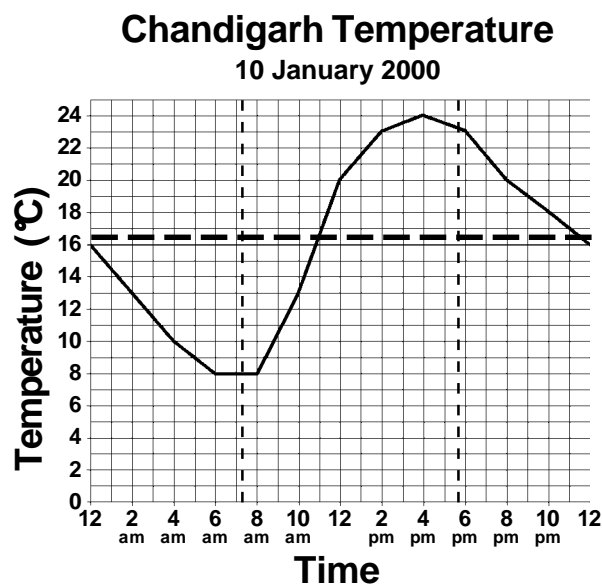
Time	Temperature
12 midnight	16°C
2 am	13°C
4 am	10°C
6 am	8°C
8 am	8°C
10 am	13°C
12 noon	20°C
2 pm	23°C
4 pm	24°C
6 pm	23°C
8 pm	20°C
10 pm	18°C

We can make graphs to show how the temperatures rose and fell that day in Chandigarh. Here are two graphs of the same data.

This bar graph is just like a row of thermometers.



To make this line graph, we just drew one point at the top of each bar and then connected the points. The thin vertical dashed lines show the times of sunrise and sunset.



*Answer the following questions about the above temperatures for 10 January in Chandigarh:*

*What was the maximum (highest) temperature?*

*What was the minimum (lowest) temperature?*

*When did the temperature start increasing?*

*When did the temperature start decreasing?*

*When was the warmest part of the day?*

*When was the coolest part of the day?*

*Why were those times the warmest and coolest?  
Discuss what factors may determine when the warmest and coolest times will be.*

*Do you think the warmest and coolest times will be the same in your area?*

## The Average, Maximum, and Minimum Temperatures

Suppose we want to know what the temperature was on 10 January 2000 in Chandigarh. Can we use just one number to get some idea of the temperature for the whole day? There are ways to do this.

One way is to find the **average temperature**.

The horizontal dashed line in the above line graph shows the average (or mean) temperature for the day.

*Use the 12 measurements of temperature in Chandigarh to calculate the average (mean) temperature for 10 January, as follows:*

*First add up all the temperatures.*

*Then divide this sum by the total number of temperatures (12 in this case).*

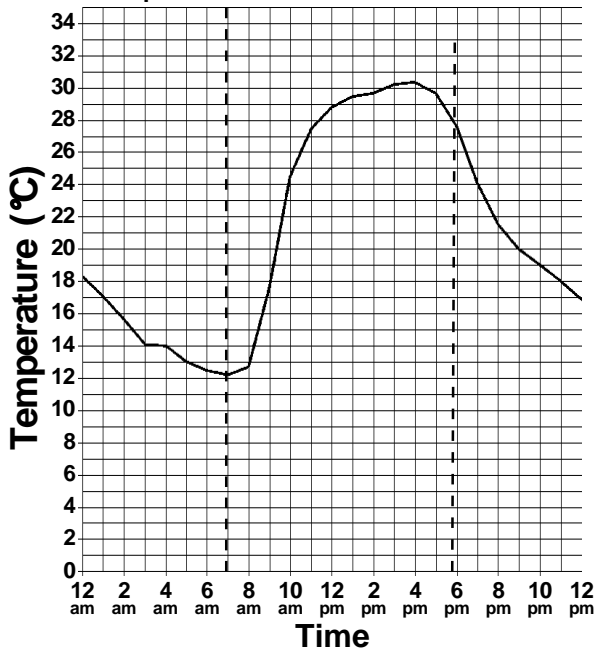
*Do you get the same number that is shown by the horizontal line in the graph?*



*Draw a line on the following graphs to show what you guess the average temperature was. Also, tell what the maximum and minimum temperatures were and when they occurred.*

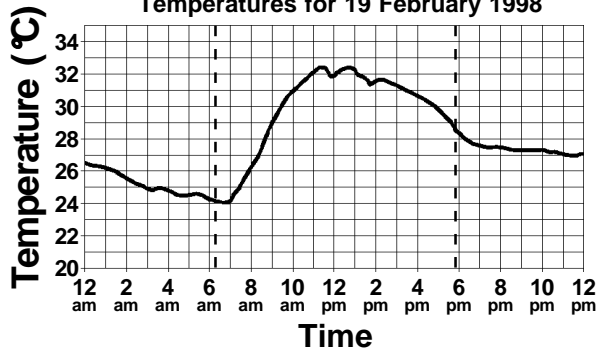
### Indore, M.P.

Temperatures for 10 December 2002



### Kalpakkam, T.N. (near Chennai)

Temperatures for 19 February 1998



### Weather Bureau Reports

In many Weather Bureaus the temperature is not recorded every hour. Instead, there are special thermometers that automatically record just the maximum and minimum temperature each day.

## Average Temperatures for each Month

If you know the maximum temperature for each day of a month, you can calculate the **average (mean) maximum temperature** for the month. You simply add up the maximum temperature of every day of the month, and then divide by the total number of days in the month. For example, you will add 31 maximum temperatures for January and then divide by 31.

Similarly, the **average minimum temperature** can be calculated by adding up all the minimum temperatures and dividing by the total number of days.

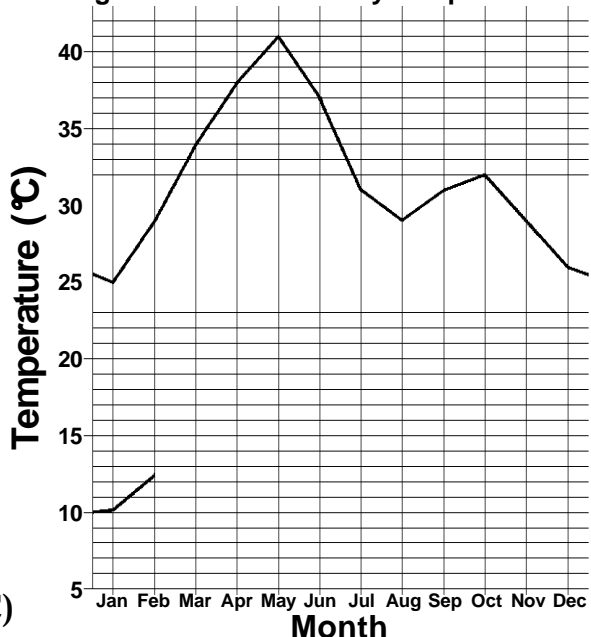
The same kind of calculation has been done for each month in Bhopal. The following Table gives the average maximum and minimum temperatures that were found. The average maximum monthly temperatures for the entire year were then plotted, as shown on the right.

### Average Monthly Temperatures in Bhopal (°C)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
MAX:	25	29	34	38	41	37	31	29	31	32	29	26
MIN:	10	12	17	22	26	25	23	22	21	18	14	11

### Bhopal

Average Max. & Min. Monthly Temperatures





*Use the data in the Table to plot the average minimum monthly temperatures for Bhopal on the same graph. The first two months have already been done for you.*

*Look at the data and the graphs to answer the following questions about Bhopal:*

*How cold does it usually get in November in Bhopal?*

*Which month has the highest maximum temperature in Bhopal? What is the average maximum temperature for that month?*

*What is the difference between the highest maximum temperature and the lowest maximum temperature in the year?*

*Which three months get the hottest in Bhopal?*

*Which three months get the coldest?*

*What is the average maximum temperature in January in Bhopal?*

*From June through December, the average minimum monthly temperature keeps falling in Bhopal. Does the average maximum monthly temperature also keep falling?*

*What is the difference between the maximum and minimum temperature in May?*

*What is the difference between the maximum and minimum temperature in August?*

*Based on your answers to the above two questions, is there a larger difference between the maximum and minimum temperatures in the summer or in the rainy season in Bhopal?*

We have seen that temperature varies with the time, the day, and the month. Now let's find out how it varies in different places.

## Different Places Have Different Temperatures

You know that different places have different temperatures. Do you know **why** they have different temperatures? There are many reasons. Now we'll take a look at some of the possible reasons.

Places that are near the sea usually have different temperatures than places far away from the sea. Temperatures differ on the top of a mountain and at its foot. And you already know that temperature changes as we go north or south from the Equator.

Do you think it gets extremely hot in this mangrove swamp near the coast?





Boats on the sea near Mumbai

## Places Near and Far from the Sea have Different Temperatures

We have already seen the average temperatures of Bhopal. Bhopal is far away from the sea. Now let's look at the temperatures of a city that lies next to the sea: Mumbai.

### Average Monthly Temperatures in Mumbai(°C)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
MAX:	30	30	31	32	33	32	30	30	30	32	33	31
MIN:	19	20	23	25	27	26	25	25	25	25	23	21

*Plot the average maximum monthly temperatures on the following graph that already shows the average minimum temperatures in Mumbai.*

*Which month has the lowest minimum temperature in Mumbai? How much is it?*

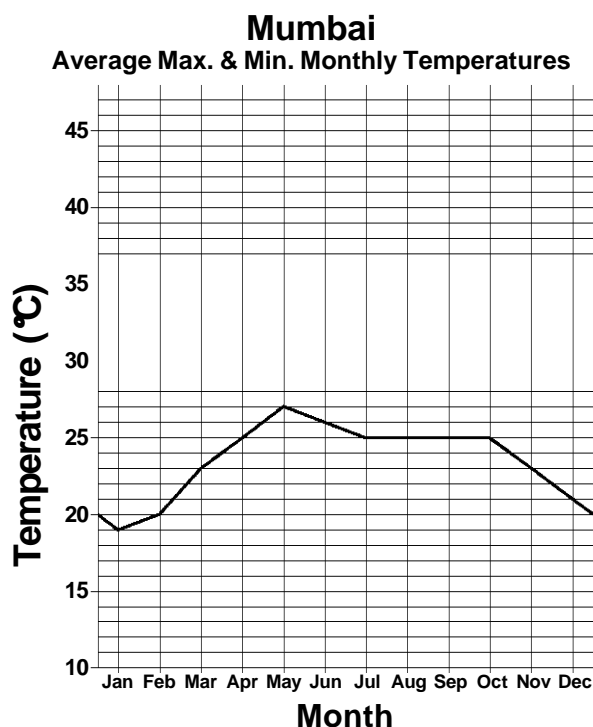
*Which is the hottest month in Mumbai? How much was the average maximum temperature for that month?*

*Compare the temperatures of Bhopal and Mumbai to answer the following*

*In January, which place is colder?*

*In June, which place is hotter?*

*In which place, Bhopal or Mumbai, does the temperature remain more or less the same throughout the year?*



## Moderate and Extreme Climates

Why does the temperature in Mumbai not change much throughout the year? Because it is on the seashore! It's difficult for the sun to heat up or cool down the sea. Since the sea doesn't get too hot or cold, the air above the sea also doesn't get too hot or cold. Therefore places near the sea usually have temperatures that remain fairly constant throughout the year. They have what is known as a **moderate** climate.

In contrast to this, Bhopal is far away from the sea. There is no moderating influence of the sea in Bhopal. In the summers the ground temperature

rises very high and this heats up the air. In winters the ground temperature falls and the air is also cold. This is called an extreme climate (that is, one with great differences between maximum and minimum temperatures).

### An Experiment

**Does the sun heat up water just as quickly as it heats up soil?** Can you design an experiment that tells you the answer to this question? Discuss your design for an experiment and what results you expect. Then try out the experiment and see what happens.

## Height and Temperature

At the peak of summer some people go from the plains to hilly places such as Pachmarhi or Shimla to avoid the heat. Even in the summer months the temperatures on high hills are low. The highest parts of a mountain generally have the lowest temperatures. Temperature decreases with elevation (height).

Look at the Graphs showing the average monthly temperatures of Delhi and Shimla. You can see quite clearly that in each month of the year the temperature of Shimla is far lower than that of Delhi.

Delhi is at an elevation (height) of about 200 metres above sea level, while Shimla is at an elevation of about 2200 metres above sea level.

Usually, for every 1000 meters increase in elevation, the temperature falls by about  $6^{\circ}\text{C}$ .

*How many meters higher than Delhi is Shimla?*

*Based on the difference in elevation, calculate about how much difference in temperature there should be between the two places.*

*Which month has the highest maximum temperature in Shimla? How much is it?*

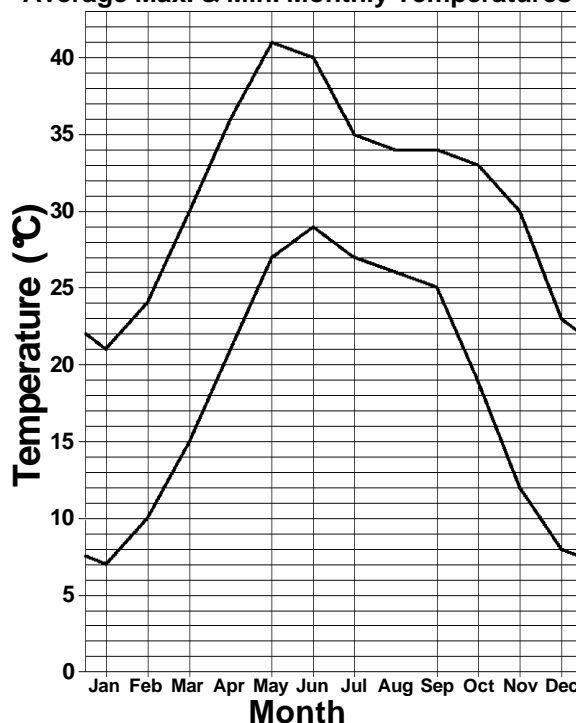
*Which month has the highest maximum temperature in Delhi? How much is it?*

*In September the average maximum temperature in Shimla is \_\_\_\_\_  $^{\circ}\text{C}$  while in Delhi it is \_\_\_\_\_  $^{\circ}\text{C}$ .*

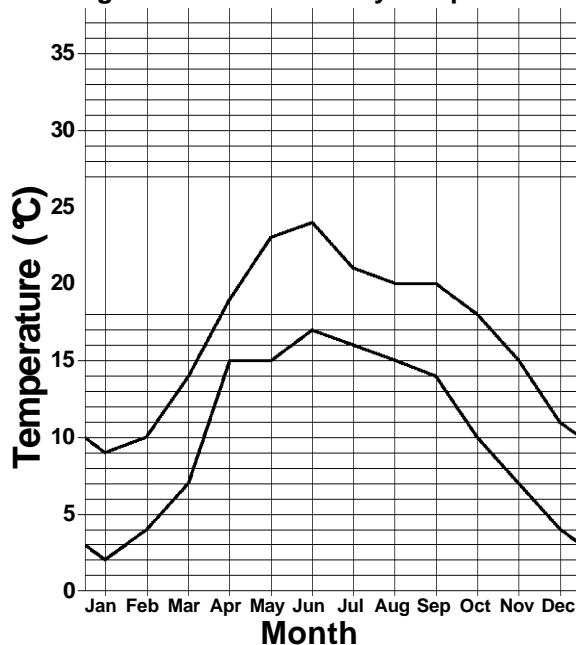
*Which is colder: Delhi in January or Shimla in July?*

*Take another look at the Extreme Temperatures in Table 1 at the beginning of the Chapter. Which places in this Table are cold because they are on mountain passes or mountain summits?*

**Delhi**  
Average Max. & Min. Monthly Temperatures



**Simla**  
Average Max. & Min. Monthly Temperatures



Since the temperature does not get so high at higher elevations, there is also a difference in the kinds of plants that grow high on hills and mountains. You can read about this in the chapter on mountains.

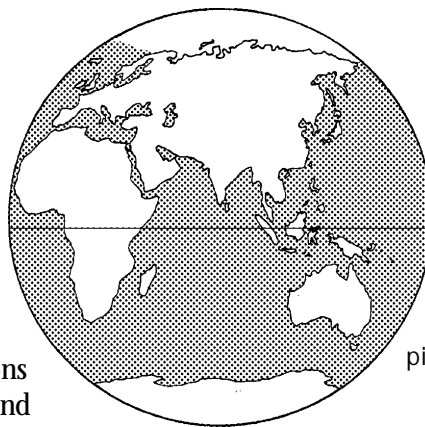
Chil trees grow at high elevations

## Temperatures in Places Near and Far from the Equator

In Class 6 we read about Indonesia, which is situated on the Equator. We also read about Iran and Japan, which are more to the north, and about the arctic tundra, which is even further north. We came to know that equatorial regions like Indonesia are quite hot throughout the year and they have no winter. As we go north or south from the equator it becomes colder, and there are separate summer and winter seasons. A look at the temperatures of places near and far from the equator will illustrate this quite clearly.

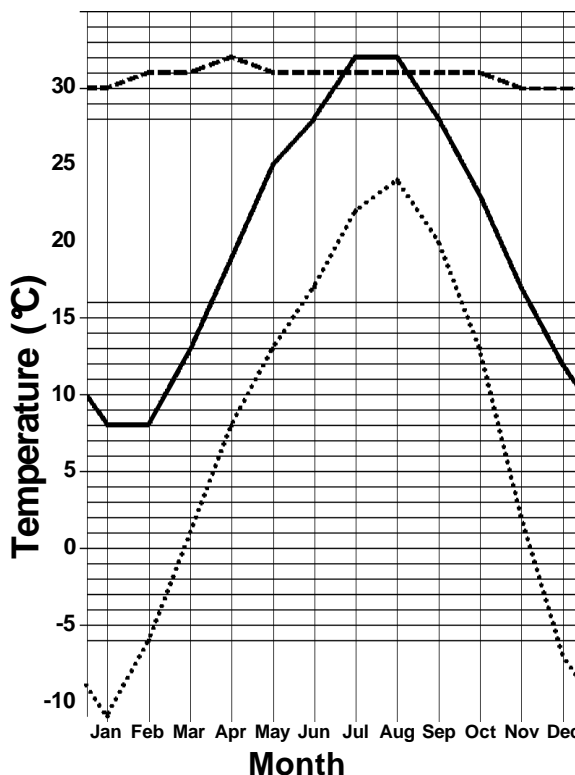
Given in the Graph on the right are the average maximum temperatures of three places: Singapore, Tokyo, and Vladivostok; as shown in the Key. In the last column of the Key, the average temperature for the whole year is shown. This is calculated by adding up all the maximum and minimum temperature readings for every month and then dividing by the total number of readings. Thus, we get to know the average temperature on an average day in the year. We might use this number to answer a question like, "Is Singapore, on average, warmer than Shanghai?"

Places near the Equator usually get more heat. Places further away from the Equator often have lower average temperatures for the year.



Find out the locations of Singapore, Shanghai, and Vladivostok, and mark them on this picture of the Earth.

**Average Maximum Temperatures**



**Month**

### KEY

City      Average Temp. for the year

-----	Singapore	27.8°C
————	Shanghai	15.3°C
.....	Vladivostok	3.9°C

*Which of the three places shown in the Graph is located near the Equator?*

*What is the average yearly temperature in that place?*

*Does it usually get much warmer in the summer than in the winter there?*

*Does it get as warm in the summer in Vladivostok as it does in the winter in Singapore?*

*Does it usually get warmer in July in Singapore or in Shanghai?*

*Which of the three places on the Graph has the most extreme climate (i.e. the greatest difference between the average maximum temperatures in winter and summer)?*

*What is the warmest month in Shanghai?*

*Which of the three places on the Graph is farthest from the Equator?*

*What is the average yearly temperature there?*

*Which month has the lowest average maximum temperature in this place?*

# Temperature Maps

India is a vast, sprawling country and the temperature varies in its different regions. If we want to find out which places are hotter and which are colder, we can use a temperature map.

Look in your Atlas to find the map of India that shows the average (mean) temperatures in January. This average temperature is the average of the maximum and minimum temperatures for the month of January.

In this map India has been divided into different sections, each marked with a different colour. By referring to the key you can find out the average temperature in January in each of these sections.

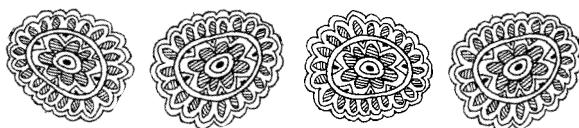
*Use the maps in your Atlas to find out the latitude and the average temperature in January of each of the following places. The first one has already been done for you.*

<b>Place</b>	<b>Lat.</b>	<b>Temperature in January</b>
Hyderabad, A.P.	17N	between 20 and 22.5°C
Chandigarh		
Agra, U.P.		
Madurai, T.N.		

According to this map, there is no place in India that has an average January temperature higher than 30°C. (Remember, this is the average. There may be some January days in some places that do get hotter than 30°C.)

*Look at the map and find out which parts of India usually have the highest average temperature (in January).*

*If you look north from this place on the map, is the average January temperature higher or lower?*



## Why is the North Cooler in Winter?

Why do you think the north of India remains cooler than the south in winters? Maybe the following data can you help figure out one answer to this difficult question. The Table below shows the times of sunrise and sunset on 10 January in the same four cities.

**Times of Sunrise and Sunset on 10 January**

Place	Sunrise	Sunset
Chandigarh	7:21 am	5:39 pm
Agra	7:09 am	5:42 pm
Hyderabad	6:49 am	5:58 pm
Madurai	6:37 am	6:13 pm

*Use the above Table to answer the following questions:*

*In which of these four cities does the sun rise first?*

*In which of these cities does the sun set last?*

*How long is the daytime in each of the four cities? (The daytime is the number of hours between sunrise and sunset.)*

*Are the cities that are further north having longer or shorter daytimes than the cities to the south?*

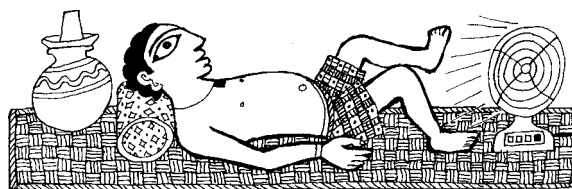
*Based on your answers to the above questions, can you think of one reason why the north of India remains cooler than the south in winter?*

## India Heats Up

Look at the map of India in your Atlas that shows the average temperatures in April.

*What is the average temperature in April at the following places:*

<b><i>Place</i></b>	<b><i>Temperature in April</i></b>
<b><i>Hyderabad</i></b>	<i>between 30 and 32.5°C</i>
<b><i>Chandigarh</i></b>	
<b><i>Agra</i></b>	
<b><i>Madurai</i></b>	



If you look carefully at this map in your Atlas you will find the average (mean) temperature of almost all of India has gone up over 25°C. What a change from the situation in January! Only in the higher parts of the Himalayas and in the Northeaster hills does the average temperature still remain below 25°C. That is to say, in just three months almost the entire landmass of India has gotten quite hot.

## Exercises

1. Colour each of the thermometers on the right to show the temperature written underneath.
2. What's the difference between the highest temperature in Table 2 and the lowest temperature in Table 1?
3. Water freezes at 0°C (32°F) and boils at 100°C (212°F). The normal human body temperature is 37°C (98.6°F). Rohini's body temperature rose from 37°C to 38°C. Harish's body temperature rose from 98.6°F to 99.6°F. Who had the higher fever, Rohini or Harish?
4. A girl in Srinagar noticed one morning that the puddles of water that were outside her house had frozen into ice. What might the air temperature have been that morning? Tick the correct answer and give reasons why it is correct and why each of the others are incorrect.
  - a) 4°C
  - b) 10°C
  - c) -3°C
  - d) -88°C

34°C 26.5°C -7°C 11.1°C 31.9°C -0.5°C 42°C -3°C



5. Suppose the temperature in Moscow was  $-8^{\circ}\text{C}$  at 10 am on 6 December. Twenty-four hours later it was  $12^{\circ}\text{C}$  higher. What was the temperature at 10 am on 7 December?
6. In Bhopal, the average maximum temperature for January is  $25^{\circ}\text{C}$ . Therefore: (tick one)
  - a) The maximum temperature on 8 January is  $25^{\circ}\text{C}$ .
  - b) The temperature never goes higher than  $25^{\circ}\text{C}$  throughout January.
  - c) The temperature at 12 noon on 12 January is  $25^{\circ}\text{C}$ .
  - d) The maximum temperature on 28 January, 2003 could have been  $27^{\circ}\text{C}$ .
7. Delhi and Mumbai are both situated on plains and their height above sea level is less than 300 meters. Why is there so much difference in their monthly average temperatures? In which months are the average temperatures in these two cities most similar? Can you explain why?
8. Given below are the average monthly minimum and maximum temperatures of Jodhpur. Make a line graph of them. Which are the hottest and coldest months of the year?

**Average Monthly Maximum Temperatures in Jodhpur, Rajasthan ( $^{\circ}\text{C}$ )**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
<b>Minimum</b>	9	12	17	22	27	29	27	25	24	20	14	11
<b>Maximum</b>	25	28	33	38	42	40	36	33	35	36	31	27

9. Given here are the average maximum temperatures of three places: A, B, and C. Make Graphs of them. What can you guess about each place by looking at the Table and Graphs?

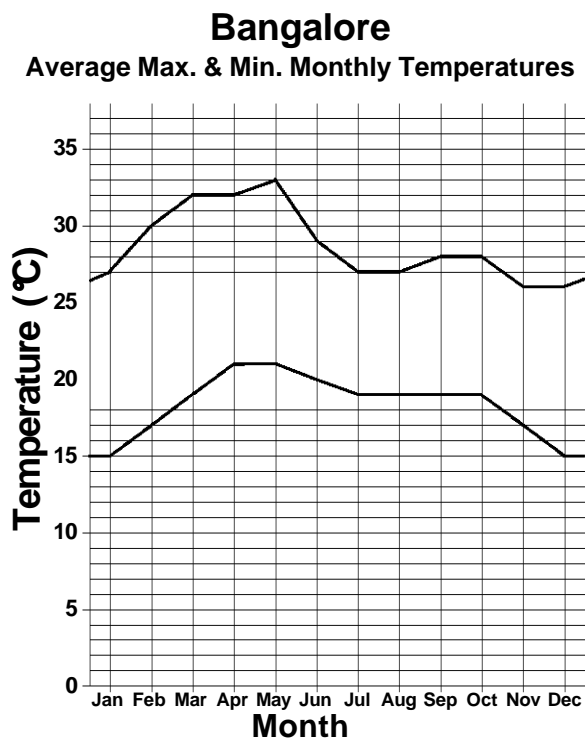
Place	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
<b>A</b>	23	26	33	38	41	39	34	33	33	33	29	25
<b>B</b>	-3	1	6	12	17	21	25	24	21	14	8	2
<b>C</b>	31	32	33	32	32	29	29	29	30	30	30	31

10. Give three possible explanations for the differences between the average temperatures in Thiruvananthapuram and Shimla in January (refer to your Atlas).

11. Between Bhopal, Delhi, Mumbai and Shimla, which two places show a similar temperature pattern? How can you explain the similarity between these two places?

12. Look at the graph on the right and answer the questions below.

- a) Does this look like the temperature graph of a place by the sea? Explain.
- b) What is the average highest temperature in July in Bangalore?
- c) How warm does it usually get in December in Bangalore?
- d) How cool does it usually get in June in Bangalore?
- e) Is there a bigger difference between night and day temperatures in May or in August in Bangalore?
- f) When is summer in Bangalore?



# Introduction to the Geography of India

*You have read about many regions and countries of the world. Make a list of them.*

*Did you feel that all of them resembled each other? In what ways did they differ?*

*Write the names of the countries or regions that have the following characteristics:*

1. *Six months day and six months night in a year* \_\_\_\_\_
2. *Heavy rain and warmth throughout the year* \_\_\_\_\_
3. *Different seasons of winter and summer in the year* \_\_\_\_\_
4. *Equatorial dense forests* \_\_\_\_\_
5. *Treeless region* \_\_\_\_\_
6. *Coniferous trees with needle-like leaves* \_\_\_\_\_
7. *Light drizzle throughout the year* \_\_\_\_\_
8. *Terraced fields for farming/step cultivation* \_\_\_\_\_
9. *Sheep-rearing* \_\_\_\_\_
10. *Plains of hard, dry grass* \_\_\_\_\_
11. *Plains of soft, juicy grass* \_\_\_\_\_
12. *Agriculture with small machines* \_\_\_\_\_
13. *Mineral oil* \_\_\_\_\_
14. *Most of the population working in industry* \_\_\_\_\_
15. *Mines of gold, diamond, chrome etc.* \_\_\_\_\_
16. *Agriculture with big machines on big farms* \_\_\_\_\_

Now that you know something about different regions of the world, let's study the different regions of our own country in greater depth.

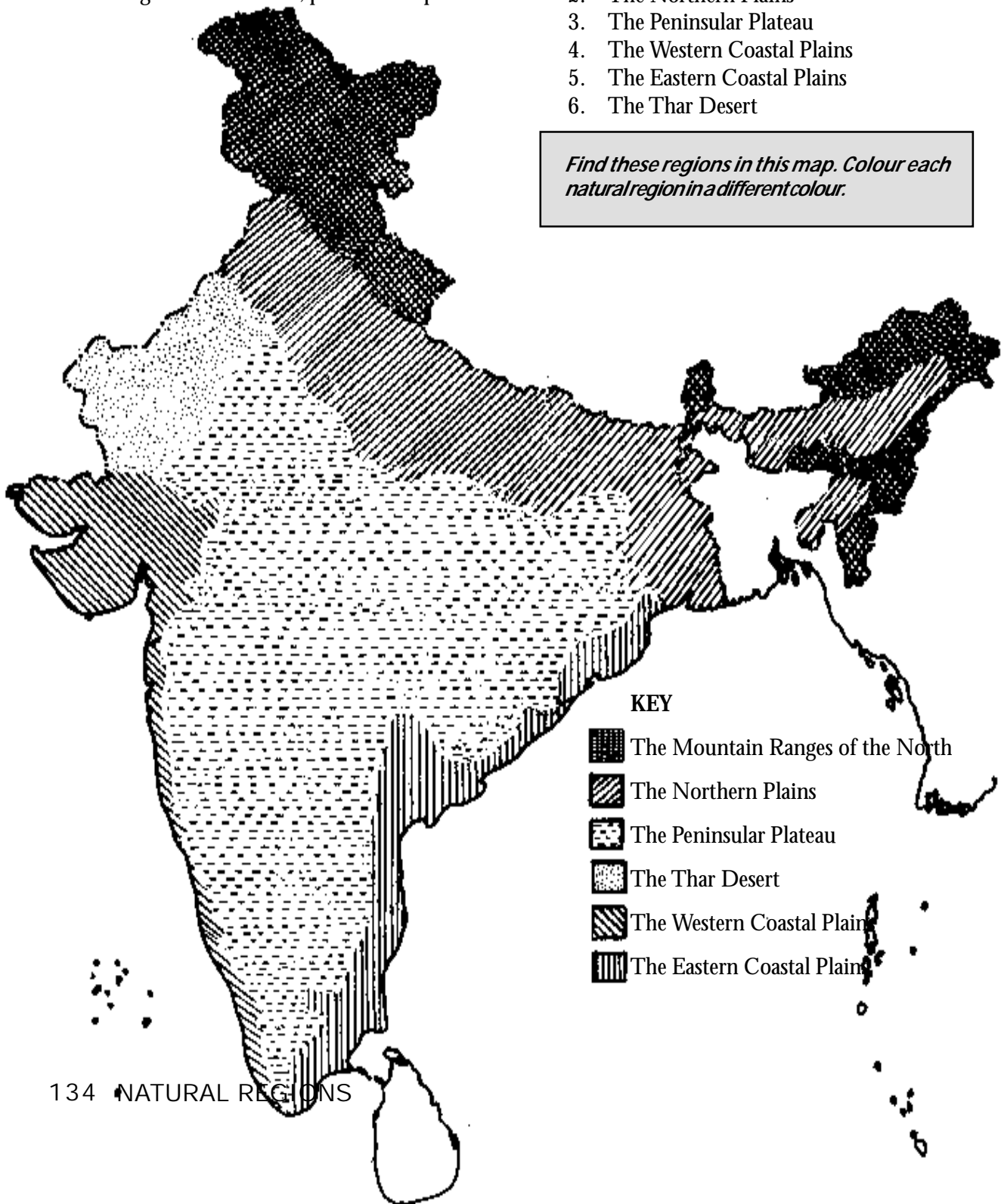
## The Natural Regions of India

India is a vast country with a lot of variation between different regions. You already know that in terms of natural land forms, there are three kinds of regions - mountains, plateaus and plains.

Based on these physical land forms, we can divide India into the following regions :

1. The Mountain Ranges of the North
2. The Northern Plains
3. The Peninsular Plateau
4. The Western Coastal Plains
5. The Eastern Coastal Plains
6. The Thar Desert

*Find these regions in this map. Colour each natural region in a different colour.*



*Find a map showing the present states of India in your atlas. Get a political outline map of India showing the state boundaries and colour the states in different colours.*

*Look at the political outline map and physical features map of India in your atlas. Compare the two and answer the following questions:*

- a) In which states do you find the Mountain Ranges of the North?*
- b) In which states do you find the Northern Plains?*
- c) In which states do you find the Thar Desert?*
- d) In which states do you find the Peninsular Plateau?*
- e) In which states do you find the Eastern Coastal Plains?*
- f) In which states do you find the Western Coastal Plains?*

*To get to know these natural regions well, get a plastic 3-D map of India's natural regions and study it.*

*Take a look at all the different thematic maps of India in your atlas. We will be referring to these maps as we study the different regions of India in the chapters that follow.*

*How many thematic maps are given in your atlas? For each thematic map that you find, tell what is the theme of the map.*

*Sort all the thematic maps that you find into a few broad themes and make a list of all the broad themes that you have found.*

*Here's an interesting question:  
What is the minimum number  
of colours you need to be sure  
that no two states that share a  
common border will be the  
same colour?*

# THE HIMALAYAS



Photo courtesy Saurabh Singh

## Eternal Snow Peaks

Very high mountains divide the Indian subcontinent from the rest of Eurasia. In addition to the Himalayas, there is the Karakoram Range in the northwest and the lower Purvanchal Hills in the Northeast.

The snow-clad peaks of the Himalayas seem to be touching the sky. They are the highest mountains in the world. The highest peaks rise to elevations of 6,000 to 8,850 metres - almost 9 km above sea level.

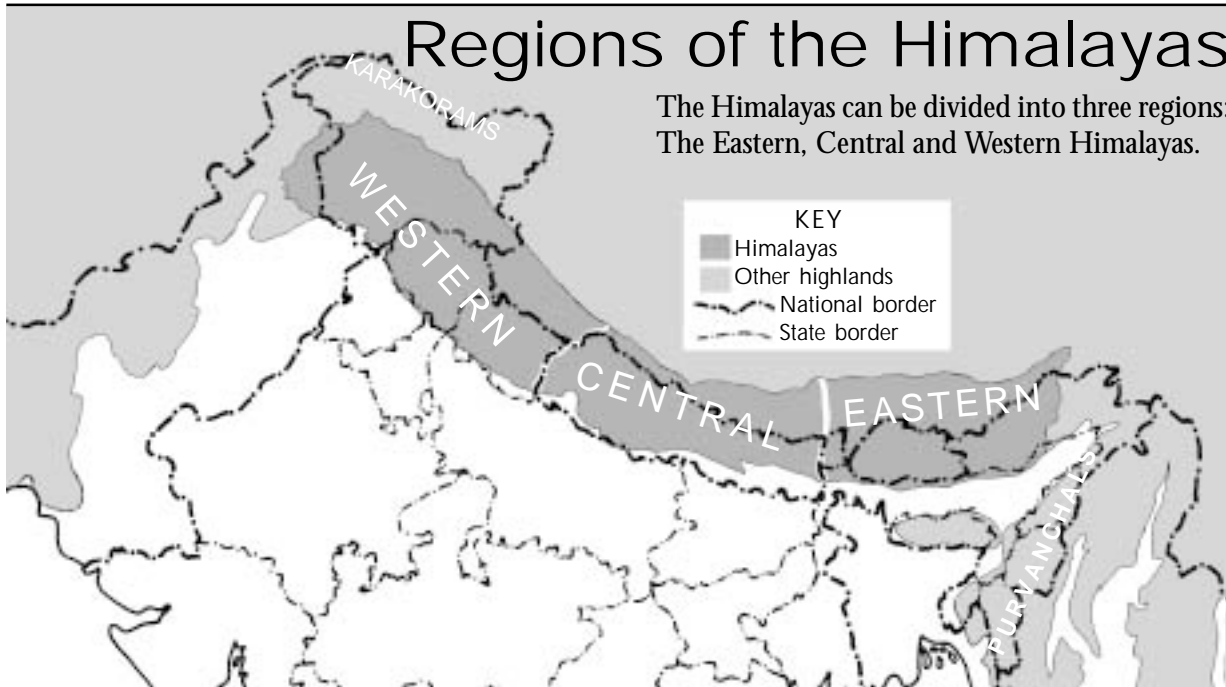
*Find the following peaks in your Atlas.*

<b>Peak</b>	<b>Height</b>
1. <i>Karakoram</i>	8611metre
2. <i>Nangaparat</i>	8126metres
3. <i>NandaDevi</i>	7817metres
4. <i>Badrinath</i>	7138metres
5. <i>Kanchenjunga</i>	8598metes
6. <i>Everest (Sagarmatha)</i>	8848metres

*Do you live in the Himalayas, or have you ever been there? Do you know anyone who has been there? If so, discuss where and what the places are like.*

## Regions of the Himalayas

The Himalayas can be divided into three regions: The Eastern, Central and Western Himalayas.



Look at the map and fill in the following Table:			
	Western Himalayas	Central Himalayas	Eastern Himalayas
<b>States of India</b> (or parts of states)			
<b>Other Countries</b> (or parts of countries)			
Look in a political map of India and find the capitals of all of the states in the above Table.			

## Summer and Winter

On the right is the temperature graph of Leh, in Ladakh (the north-eastern part of the State of Jammu and Kashmir). It shows the average maximum and minimum temperatures for each month of the year.

*Find Leh on a map. Is Leh north or west of Delhi? What is the direction from Shimla to Leh? What is the direction from Srinagar to Leh? What major river flows close to Leh?*

*What are the warmest and coldest months in Leh, and how warm or cold are they?*

*Does it usually go above 0° Celsius in January in Leh?*

*How cold does it usually get at the hottest time of year in Leh?*

From the next graph you can get some idea of how cold it gets in different parts of the mountains, as compared to Delhi, which is in the plains. The average minimum temperatures of Leh, Darjeeling, and Delhi are all shown in one graph.

*How cold does it usually get in January in Darjeeling?*

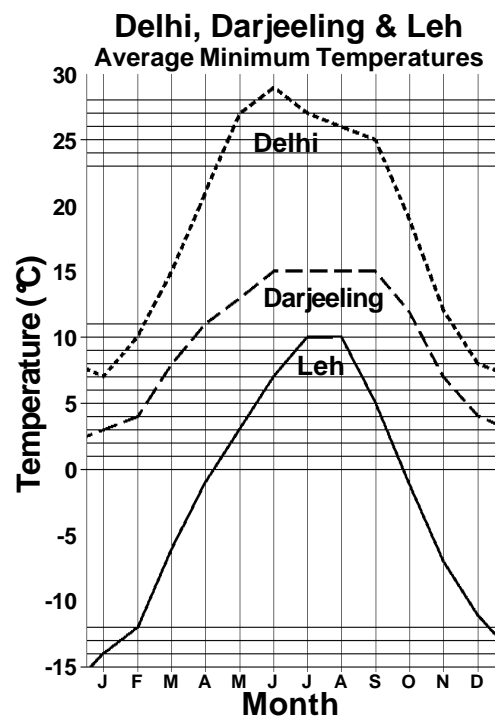
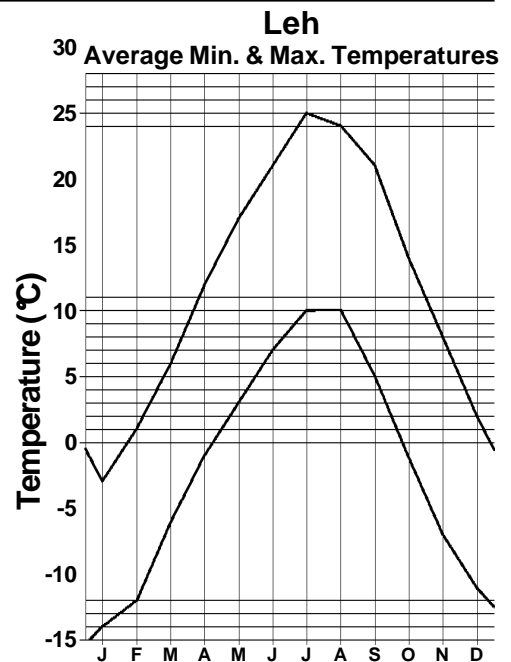
*Which is colder: Delhi in December or Leh in June?*

*Which of these three places has the coldest climate?*

*Based on the temperature graphs, guess how high above sea level each of these places are: match each place to its elevation.*

<i>Darjeeling</i>	<i>237 metres</i>
<i>Delhi</i>	<i>3505 metres</i>
<i>Leh</i>	<i>2134 metres</i>

*Why do the highest peaks of the Himalayas remain snow covered throughout the year? Why doesn't all the snow melt away in the summers?*



# Snow, Ice and Rivers

Himalaya means the abode or home (Aalaya) of snow (ihma). There is snow in the Himalayas throughout the year at heights above about 4,500 metres. In winter, snow falls at elevations down to about 2000 metres. The roads to many villages and towns that are high in the mountains are blocked by snow in winters, cutting these areas off from the rest of India.

*Look in your Atlas and make a list of the major rivers that rise from the Himalayas.*

The rivers that rise from the Himalayas are perennial – meaning, they flow throughout the year. Why don't they ever dry up and stop flowing like some rivers in other regions?

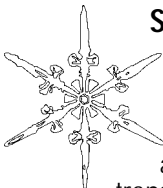
## Melting Snow and Glaciers Feed Rivers

In the spring it gets warm in the lower areas, and a lot of snow and ice melts. This feeds rivers. When snow melts it becomes water, which forms small rivulets.



The rivulets join together as they rush down the slopes, becoming streams. The streams (or 'headstreams') join together to become rivers, which get wider as more streams join them. These rivers cut through the high mountains, swiftly flowing through deep gorges and valleys.

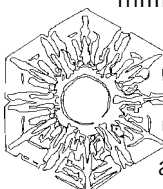

High valleys in between the snow peaks are often covered with glaciers – slowly moving 'rivers' of ice. Glaciers are formed when a lot of snow



### Snow and Ice

Do you know the difference between snow and ice?  
Ice is hard and cold, and sometimes transparent.

Snow falls from the sky as snowflakes (about 1 millimetre in size), or small clumps of snowflakes (as big as 1 cm). Here are three magnified pictures of single snowflakes. They are actually crystals of ice. When they fall, the ground gets covered with a soft, white layer of snow. Snow can get compressed, partially melted, refrozen, and changed into ice.



accumulates, gets compressed into ice, and slowly flows down the valleys (usually at speeds of only about a few centimetres per day). The glaciers melt when they reach lower, warmer altitudes, thus giving rise to rivers.

For example, the Gangotri Glacier gives rise to the Bhagirathi River. The Bhagirathi flows down to meet the Alaknanda River at a place called Dev Prayag. From here they flow as one river called the Ganga.



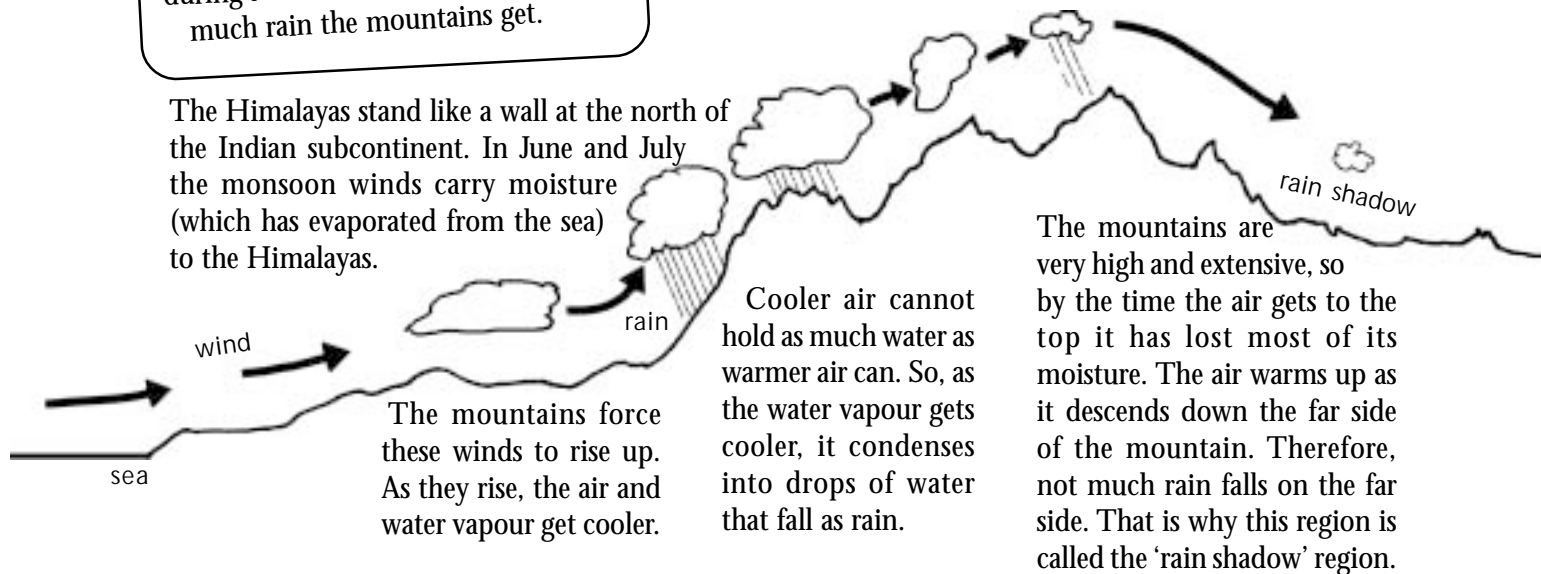
*Run your finger up the course of the Ganga on a wall map of India. Can you find Gangotri?*

*Also look in the Himalayas for the sources of the Satluj, Yamuna, Beas, Brahmaputra, Indus, Ghaghara, Gandak and Kosi.*

*Try and locate the following glaciers on a map: Yamunotri, Pindari, Baltoro, Siachen.*

Besides getting fed by melting snow, the rivers also get fed by rains during the monsoon. Let's find out how much rain the mountains get.

## Rain on the Himalayas

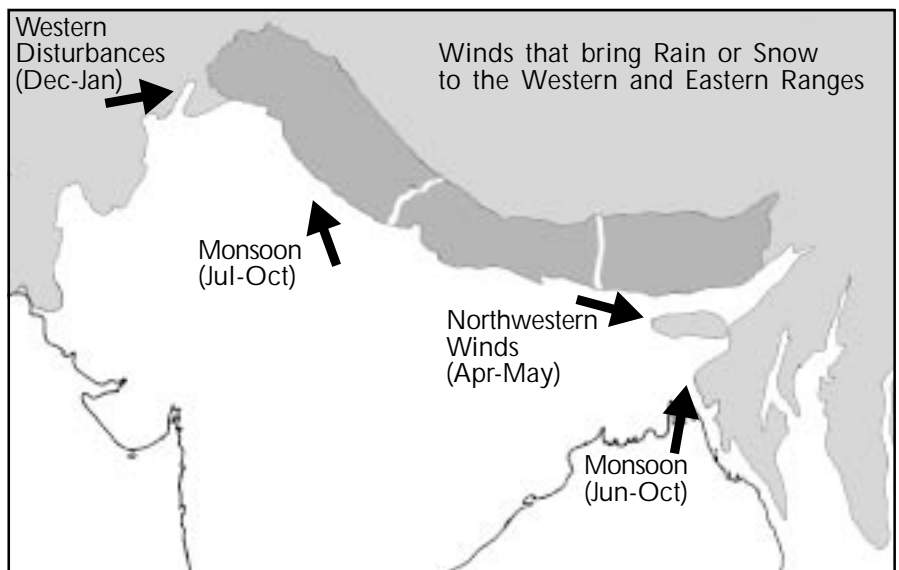


Thus, the parts of the Himalayas that face the plains of India have heavy rainfall during the monsoons.

The Purvanchal Hills and the southern face of the Eastern Himalayas get heavy rainfall each year. This is mainly because the monsoon winds release the moisture they carry from the nearby Bay of Bengal. The monsoon comes early to this region (around 1 June), and remains until the middle of October. Winds blowing from the northwest bring additional rain in April and May.

In the Western Himalayas, the winter winds blow from the west ('Western Disturbances'). They carry moisture from the Mediterranean, Caspian Sea and Persian Gulf. As the winds rise

over the Western Himalayas, this moisture falls as snow. But little of it reaches northern Kashmir and Ladakh, as you can see on the graph and maps in your Atlas. (The Western Disturbances also cause a cold wave in north India, preceded by a few days of winter rain that is very important for the rabi crop.)



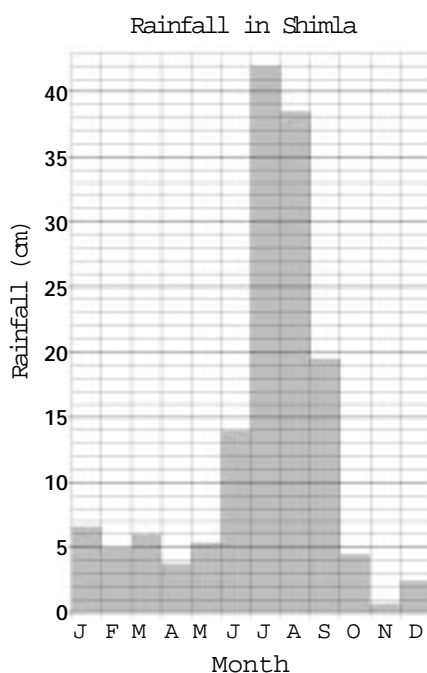
Below is a bar graph that shows how much rain falls each month in Shimla. The precipitation that falls as snow is also included in these 'rain' graphs as well as in the maps in your Atlas.

*How many centimetres of rain does Shimla usually get in July and December?*

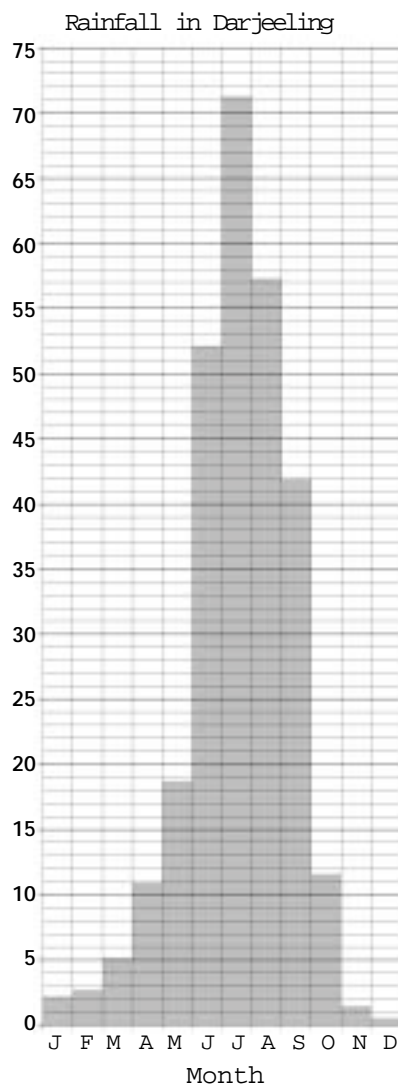
*Which months are the monsoon months in Shimla?*

*How much rain does Shimla usually get from June through September?*

Some years there is less rain and some years there is more. These graphs show the average rainfall for each month for the last 20 years.



Here are some more rainfall graphs. Examine them and look in your Atlas at the map showing annual rainfall in order to answer the questions on the right.



*In which month does Darjeeling usually get the most rain? How much does it get in that month?*

*In which month does Leh usually get the most rain? How much does it get in that month?*

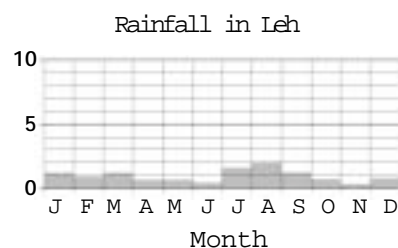
*Which place gets the most rain in a year: Leh, Darjeeling or Shimla? Which of these three places gets the least amount of rain in a year?*

*Why does Leh get less rain than Darjeeling?*

*Look at the annual rainfall map of India and find out about how many centimetres of rain fall each year in Gangtok, Itanagar, Jammu and Gangotri.*

*Which Himalayan region has heavier rainfall, the eastern or the western?*

*Do you think the part of the Eastern Himalayas that lies further north in China gets the same amount of rainfall as the part in India? Explain.*



Have you ever wondered why vegetation changes from place to place? Let's investigate how and why different places have different vegetation.

# Natural Vegetation of the Himalayas

This diagram shows some typical vegetation in the Himalayas. The mountain has been divided into five levels of elevation. Some of the main types of trees are shown here.

no vegetation 1

grass 2

conifers 3

broadleaf trees 4

Terai 5



*Is the same vegetation growing at all the different levels?*

Oak  
Level 3

Birch  
Level 3

Spruce  
leaves and  
cone  
Level 3

The highest peaks of the Himalayas are cold, windy and covered with snow throughout the year. Some parts are covered with rock. The highest peaks get less precipitation (rain and snow) than the lower peaks that face the plains of India.

Snow covers the areas below this during the winter. It remains quite cool even in the short summer season, when the snow melts. In summer grass grows on these slopes.

The lower slopes are warmer, and they get more precipitation. Coniferous trees grow here.

At the bottom of the Himalayan slopes there is the **terai** region. It is quite hot here and the rainfall is heavy. Some wild animals like chital (spotted deer), leopards and tigers roam here in thick forests of tropical broadleaf trees, such as sal, shisham, khair and sandalwood. These trees cannot withstand frost.

We see that different plants grow at different heights above sea level because different elevations have different climates.

*For each of the five elevation levels in the diagram, give reasons for the type of vegetation.*

Let us now look into the lives of the people living in the Himalayan region.

## Life in the Western Himalayas

### Forests are Being Destroyed

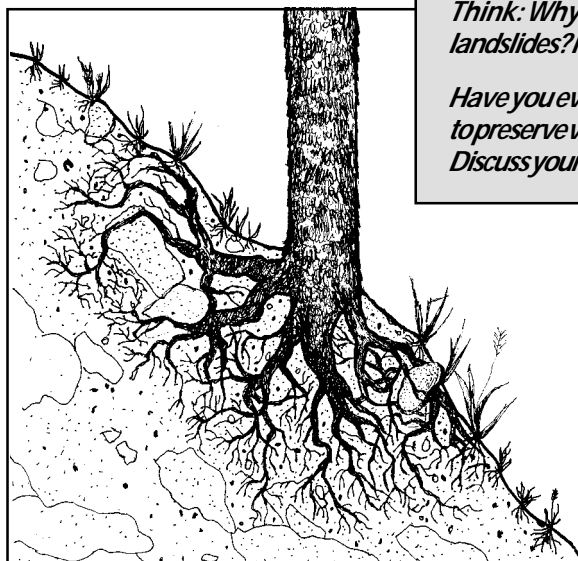
In 1950, 38% of the land in Himachal Pradesh was covered by forests. Today less than 18% is forested. Why are the forests disappearing so rapidly? Wood is in great demand, since it is used in construction, for making furniture and paper, and as a cooking fuel. The fewer trees there are, the more expensive wood becomes. Thus, selling wood becomes more lucrative.

The government owns most of the forested land and gets a good income from the trees. The forest department cuts down specified numbers of trees and auctions them to contractors. If only small areas are cleared, leaving some trees uncut here and there, the forests will regrow. New trees can also be planted. However, trees grow slowly and if too many trees are cut too frequently the forests disappear. This disappearance of forests is called **deforestation**.

Deforestation is having harmful effects on the environment in the Himalayas. When all the trees on a slope are cut, the **topsoil** gets easily eroded and washed away in the rains. The topsoil contains humus and is the fertile part of the soil.

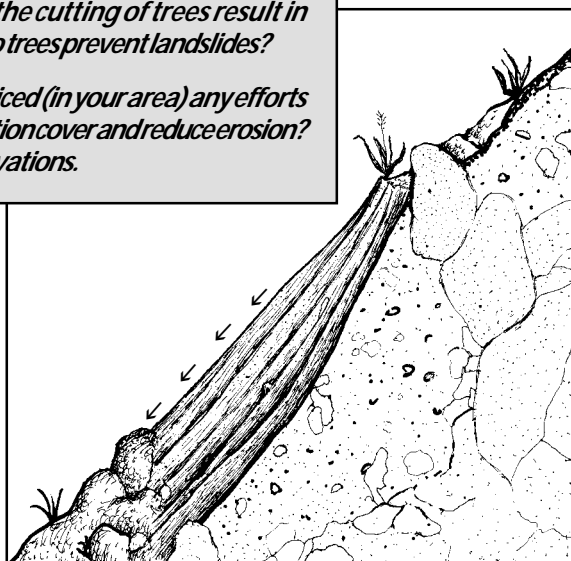
After erosion, a hard, rocky soil is left. These mountain slopes do not have very hard rocks. Once trees are cut, the rocks and soil on the steep slopes crumble and slide down the mountains. Such **landslides** occur particularly when it rains. This has become a serious problem. Sometimes, entire villages are buried under landslides, killing people and destroying their homes. Sometimes roads are blocked by landslides. Landslides can also dam rivers and create lakes. But these are only temporary lakes. When the pressure of the collected water becomes too much, it breaks through the debris and floods the lower parts of the valleys. Such sudden 'flash floods' are devastating.

The people of Kumaon and Garhwal regions of Uttaranchal launched a movement, known as the 'Chipko' movement, to halt the destruction of the hills and protect the environment. Whenever contractors came to cut trees the people from nearby villages would hug the trees and not allow the workers to cut them. Due to growing awareness and pressure from the people, trees are once again being planted on the naked mountain slopes where forests have been cut.



*Think: Why does the cutting of trees result in landslides? How do trees prevent landslides?*

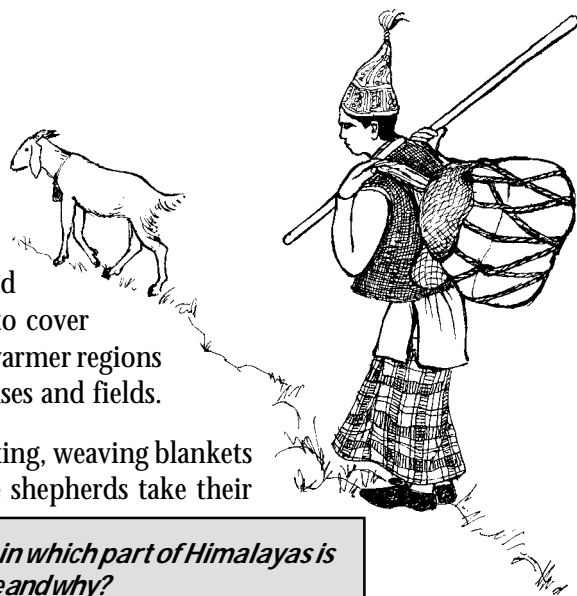
*Have you ever noticed (in your area) any efforts to preserve vegetation cover and reduce erosion? Discuss your observations.*



## Sheep and Goat Herding

The grass growing in the higher parts of the Himalayas during the summer months is good for grazing sheep, goats and other animals. Thus, in the western Himalayas a lot of sheep are reared for meat and wool. When summer ends, and the winter snows begin to cover the slopes, the shepherds bring their animals to the lower, warmer regions of the Himalayas. This is where they have their pucca houses and fields.

In winter, people work in their homes, spinning wool, knitting, weaving blankets etc. When summer comes, the grass grows again and the shepherds take their animals back uphill to graze.



*During winter, in which part of Himalayas is fodder available and why?*

## Flat Fields on Steep Slopes

There is very little land fit for cultivation in the Himalayas. In the wide valleys and on the less steep hills some crops can be grown. But many places are too cold. Some slopes are too rocky. The northern faces of hills get less sun.

Do you know how fields can be made on steep slopes? The hillsides can be made into terraces.

People have settled wherever they can do some farming. But because cultivable land is scarce and scattered, the villages are small and far apart. Even the houses belonging to one village are usually widely scattered over a hillside. The number of people living in the mountains is less than the number living in valleys and plains.

*Where else have you read about or seen terraced fields? What are its advantages?*

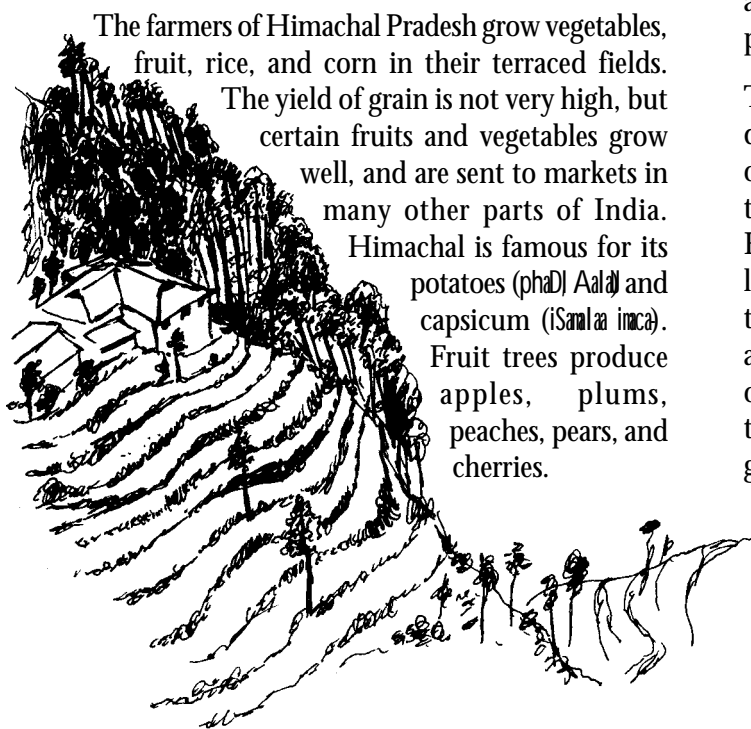
*Why it is possible for a larger number of people to live close together in the villages of the plains, unlike those of the mountains?*

## Roads and Agriculture

It used to be that walking many kilometres over narrow winding paths up and down the hill slopes was the only way to get from one place to another. But since 1947, many remote areas have been connected by roads. With the growth of transport, farmers began growing more and more vegetables. The number of orchards also increased. Their fruits and vegetables began to be sold in markets in many parts of India.

The hill people did not have enough money to develop large orchards themselves. So many well-off farmers from Punjab and Uttar Pradesh took the opportunity to buy land in the forests of the Himalayas. They cleared the forests and planted large orchards, especially apple orchards. Even today, many of the orchards in Himachal Pradesh are owned by them. Local people work in the orchards as labourers. Many people are employed to pack the fruit in cartons and to transport these goods to cities.

*You can see how important transportation has been in changing the geography, the economy and the society of a region!*



The farmers of Himachal Pradesh grow vegetables, fruit, rice, and corn in their terraced fields.

The yield of grain is not very high, but certain fruits and vegetables grow well, and are sent to markets in many other parts of India.

Himachal is famous for its potatoes (phadi Aala) and capsicum (isamla imca).

Fruit trees produce apples, plums, peaches, pears, and cherries.

*Has the growth of railways and roads in your region led to as important changes as it has in Himachal Pradesh? Discuss.*

*Discuss in small groups: If you were a farmer growing apples in Himachal Pradesh, what would you prefer to do with the apples: (1) Sell them yourself in a local small town market; (2) Sell them to a trader who sells them to tourists in Shimla; (3) Sell them to a trader who transports them to cities in the plains; (4) Sell them to a foreign company which uses them to make jam for export to other countries. Give reasons for your choice. Why might you get more or less profit in each case, and would you have any other considerations besides profit?*

## Electricity and Industry

*Look back through what you have read in this chapter so far and make a list of all the natural resources and agricultural products of the Western Himalayan region. Tell what kinds of industries could be based on each of these resources and agricultural products. For example: Wool could be used for making \_\_\_\_\_. Trees could be used for making \_\_\_\_\_. (Make this list as long as possible.)*

Are the swiftly running rivers a natural resource? What can they be used for? One thing they can be used for is to generate electricity. **Hydroelectric power plants** use water power to generate electricity.

There are a number of hydroelectric generating plants in the western Himalayas, and more are under construction. Every village in the state of Himachal Pradesh is electrified.

Although, this electricity could be used to run big factories and industries, there are very few big industries in the Himalayas. This is because there is a scarcity of mineral resources such as iron and coal.

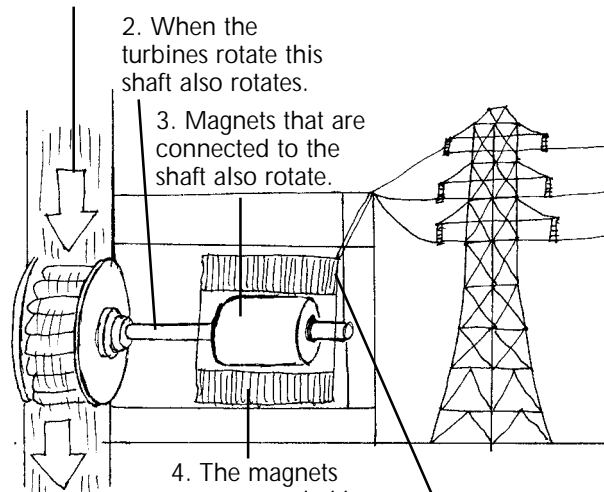
However, one important mineral is found in the Himalayas. This is limestone, which is used in making cement. People are employed in limestone quarries and cement factories.

## How Does a Generator Produce Electricity?

1. Falling water makes the turbines rotate.

2. When the turbines rotate this shaft also rotates.

3. Magnets that are connected to the shaft also rotate.



4. The magnets are surrounded by coils of wire.

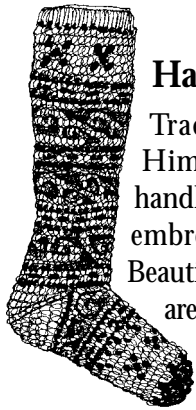
5. The moving magnets make electric current run in the wire.

*What can people construct with cement?*

Unfortunately, there are several problems in connection with the cement industry. Landslides sometimes occur in limestone quarries and around construction sites where the forests have been cleared away. The dust and debris from the quarries also accumulates on roads and fields and in rivers, which causes health problems in people and affects the growth of trees and crops as well.

*Which characteristics of the Western Himalayas support industrial growth?*

*Which characteristics of the Western Himalayas hinder industrial growth?*



## Handicrafts and Tourism

Traditional industries in the Western Himalayas include handicrafts such as handloom cloth and shawls, knitted items, embroidery (kSaldakarI) and woodcarving. Beautiful objects of lacquer and papier mâché are also produced, particularly in Kashmir.

All of these are home-based industries, done either by artisans independently or working on contract for traders.

Another very important industry that has been growing in the hill regions is tourism. With the increase in roads, well-to-do people from the cities and foreign countries visit Kashmir, Himachal Pradesh, Uttarakhand and other places to enjoy the natural beauty and cool climate of the Himalayas. Many people also come to important pilgrimage centres like Vaishnodevi, Badrinath, Kedarnath, Gangotri and Dharamshala.

Hotels and restaurants have been built for the tourists. Taxi drivers take them around to see the different tourist sights. People sell things to the tourists. Many local people are finding employment in these businesses. Some people find

that they can make more money by renting rooms in their houses to tourists and opening small restaurants than they could make in agricultural work. Thus, in some places the amount of farming has recently decreased.

## Unemployment and migration from the hills

Some people from the hills work as labourers in the large cities of the northern plain. There is a shortage of agricultural land on the hills, so farming is limited. There are only a few industries in the Himalayas. Also, there are no big cities. That is why there are not many different ways of earning a livelihood. On the other hand, there is a lot of industry, business and commerce in many large cities on the plains. Hence, the possibility of getting employment is greater there. That is why people from the hills go to cities like Kanpur and Delhi. Some of them return to their villages in summer to farm their land, or work in tourism. Some go to the large cities just to sell their shawls, carpets and other handicrafts. Others decide to settle down in the cities on the plains.

Now let's find out something about how people live in the rainy North East.

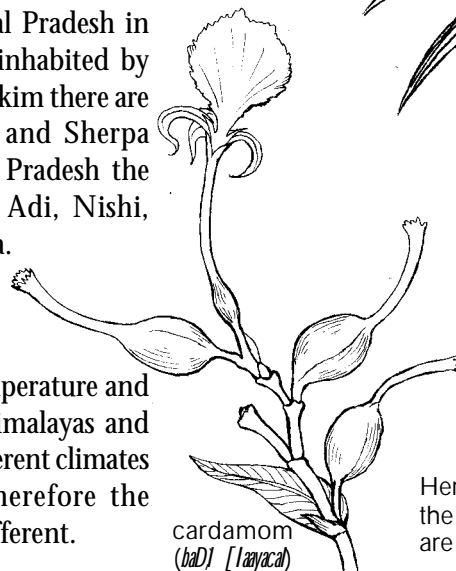
## Life in the Eastern Himalayas and Purvanchal Hills

The states of Sikkim and Arunachal Pradesh in the Eastern Himalayas are mainly inhabited by tribal communities (adivasis). In Sikkim there are the Nepali, Bhutia, Lepcha and Sherpa communities. In Arunachal Pradesh the main communities are the Adi, Nishi, Apatani, Mishmi and Monpa.

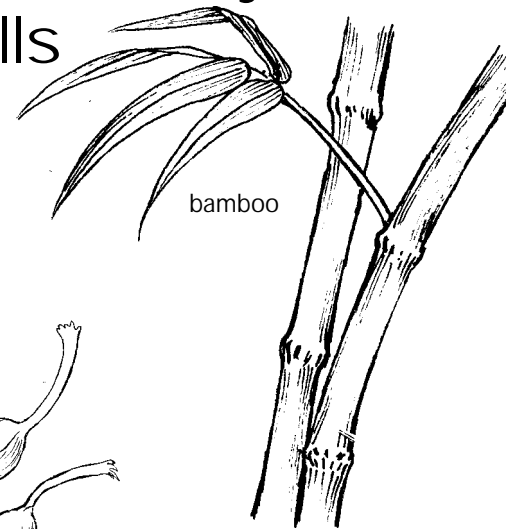
### Agriculture

We have already seen (from the temperature and rainfall graphs) that the Eastern Himalayas and Purvanchal Hills have somewhat different climates than the Western Himalayas. Therefore the vegetation and agriculture is also different.

The leaves of this tree are tejapata, and the inner bark is cinnamon (*dalacalna*)



cardamom  
(baD) [Iayaca]

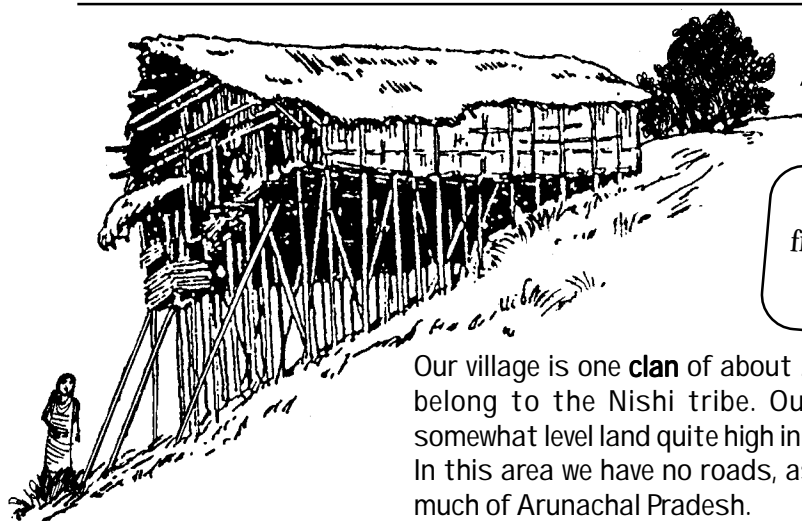


bamboo

Here are some pictures of the kinds of plants that are grown in this area.



Farming is difficult because of the steep slopes and high rainfall. In the flat lands in valleys, rice is grown in the same fields year after year. The paddy fields are ploughed, and modern inputs such as fertilizers and pesticides are being used increasingly. However, if the soil on hill slopes is ploughed, it flows down the hillsides in the torrential downpours. Even making terraced fields does not completely stop this erosion. Therefore there is another type of farming in this region called *jhoom* farming.



## A Jhoom Field Diary

Let's learn about jhoom farming from the diary of some people who live in a village in Arunachal Pradesh.

Our village is one **clan** of about 20 families. We belong to the Nishi tribe. Our village is on somewhat level land quite high in the mountains. In this area we have no roads, as is the case in much of Arunachal Pradesh.

Our houses are propped up on bamboo stilts on the hillside. This is the best way to build a house here because the ground is usually very wet, with so many scorpions, leeches, snakes and insects running around. Around our houses we have small gardens with fruit trees, vegetables, tea and coffee.

### 12 December - Searching for Fields

At this time of year it's dry and quite cold here – although we don't get snow. We get so much rain most of the year, but it all flows downhill, and from December to February we have trouble even getting drinking water. We have to go down the steep path to the river in the valley to fetch water.

This is the time of year that we prepare our fields for cultivation. Each year we make fields on a different part of our land. Because the thin topsoil gets quickly washed away by the heavy rains, after two or three years of farming the fields lose their fertility. The fields we used last year will be left fallow for at least 7 or 8 years so that the forest will grow and the soil will become fertile again.

I use this bamboo container to carry water



The land on which our village is located plus two other forested hills all belong to our clan. No one family owns any part of it – we all own it together. But other clans cannot farm on it.

Today we went around looking for a part of our forest to clear for the new fields. After a lot of debate, we decided on the southern slope of our nearest hill.

### 13 December - The Forest is Cleared

Today we began cutting down the trees for our new fields. This is a lot of hard work. All the men of our clan work together felling trees and preparing each family's field in turn. There are no labourers to hire around here – anyway we don't need them since we all help each other out.

We leave the stumps of the trees standing. The stumps and roots prevent the soil from being washed away by the rain. We leave the logs lying in the fields to dry out.

We have also left a few trees standing because they produce certain fruits. Each year all the women climb up and down the hillsides to gather the ripe wild fruits. They also collect a few different kinds of tubers from the forests.



### 2 February – Hunting

Today a group of men went hunting in the forest. They brought back a deer. We eat meat as often as we can get it, but these days the number of animals is decreasing and the government has put many restrictions on hunting.

### 11 March - The Trees are Burnt

Today we have started burning the dry logs in the fields. After the fires die out, all that will remain is ash and some half-burnt tree stumps.

### 24 March – The Rains Resume

The rains have started again. After just two showers, the ash that was lying in the fields has mixed with the soil, making it more fertile.

## 4 April - Sowing

The *jhoom* field is ready for sowing. These days there are light drizzles. Heavy downpours will begin from May. So we have to finish the sowing before May. Everyone who can work - women, men, and some children - go to the *jhoom* field, carrying seeds, baskets and hoes. We don't use the hoes to plough the fields, though. We use them to dig small holes in the soil. Then we place seeds in the holes, and cover them with soil, working from the bottom to the top of each field.

All the crops each family uses are sown together in the family's *jhoom* field. So one field contains at the same time rice, corn, *jowar*, sesame (til), beans, onions, tobacco, cotton, sweet potatoes, chilly, pumpkin etc.

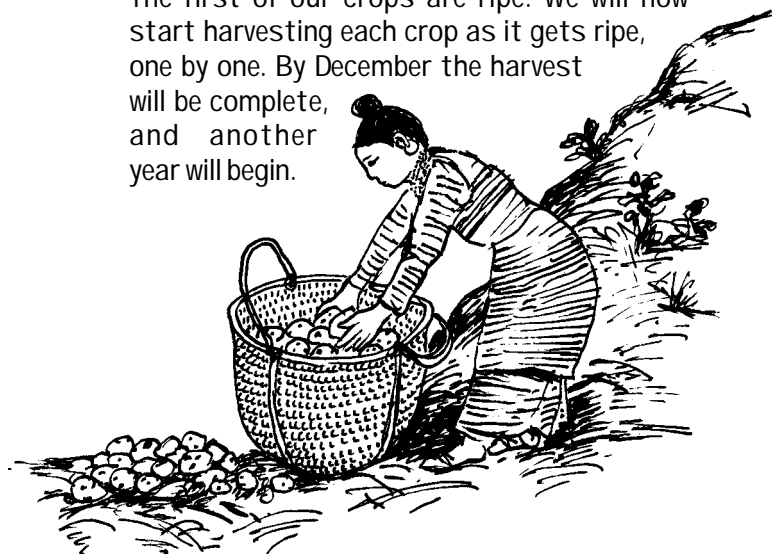
We are also building *machaans* and huts in the fields so that someone can stay and look after the fields, protecting the crops from the wild animals.

## 26 June - Weeding

Now the really heavy rains are coming every day. The crops are growing very quickly. But weeds are also growing rapidly. We have to weed the fields about 4 or 5 times.

## 3 August - Harvesting

The first of our crops are ripe. We will now start harvesting each crop as it gets ripe, one by one. By December the harvest will be complete, and another year will begin.



*In the History chapter on adivasis in British times, you read about a tribe in Orissa that practiced a similar kind of agriculture. How was this different from the present day jhoom farming in the Eastern Himalayas?*

*How does the soil get fertile in jhoom farming?*

*Is jhoom more suitable than terrace farming in the Eastern Himalayas? Give advantages and disadvantages of each method of farming.*

*Does jhoom farming destroy forest in the long run?*

## Development and Problems in the Northeast

These days jhoom farmers are facing great difficulties. On the one hand, forests are rapidly being cut away for industries. On the other hand the population of the region is increasing. As a result, land available for farming is shrinking.

Whereas earlier jhoom farmers would leave a field fallow for twenty years, they can scarcely leave it for four or five years these days. This is not long enough for proper regrowth of the forest. Therefore the soil does not get very fertile and the crop yield is low. Efforts are being made by the government to help people give up jhoom farming and take to terrace cultivation to a greater degree.

In other chapters you will learn about adivasis in other states of India and the many hardships they have faced. You will learn about how zamindars, traders and moneylenders have grabbed their land. You will see how the adivasis in many places got no particular benefit from the industries set up in their areas.

The situation of the adivasis in the eastern Himalayan states of India is quite different. A law has been passed that no outsiders can go there without the permission of the government, let alone buy land etc. Hence, no outsider has been able to grab agricultural or forest land here. The tribes have been able to develop freely and, today, senior officials, teachers, traders and shopkeepers are all tribal people. The spread of modern education has contributed greatly to this

development. Tribal youth have acquired education and reached high positions in their states.

People are also engaged in handicrafts such as weaving and making bamboo products. But in the absence of big industries or commercial agriculture new avenues for earning one's livelihood are limited. There are few opportunities for employment. Farmers sell only a small percentage of their crops, so they do not have much money to buy many other things they need. However, compared to the people of the Western Himalayas, fewer people from the Eastern Himalayas go out in search of employment.

## Tea Gardens

There is one crop grown in the Eastern Himalayas that reaches all corners of the country, and that is tea. Some of it is also exported to other countries.

Most of the tea used in India comes from the northeast. In the lower hills and the valley of Assam and northern part of West Bengal there are vast tea gardens. New leaves of the tea plants are plucked, shredded in machines and dried before being sold as tea.



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## Exercises

1. *The Himalayas do **not** extend into which of the following places: Madhya Pradesh, China, Uttar Pradesh, Sikkim, Haryana, Punjab, Pakistan?*
2. *Why do the rivers that flow from the Himalayas have water all year round? Where do they get water from?*
3. *Why do sheep herders climb to the higher parts of the Himalayan mountains in summer and why do they leave these areas in winter?*
4. *Why are houses scattered farther apart in mountains than in the plains?*
5. *Make one list of the crops grown on the Western Himalays, and another list of crops grown on the Eastern Himalayas.*
6. *How does the construction of roads in hills encourage the development of agriculture? How does the construction of roads in hills discourage the development of agriculture?*
7. *Why do landslides occur in the Himalayas?*
8. *Make a list of the similarities and differences between the vegetation and climate of the Eastern and Western Himalayas.*
9. *Considering the expense of transporting agricultural produce, why do Himachal farmers still find it profitable to sell fruits and vegetables in the plains?*
10. *From the felling of trees to the harvest of crops, what are the various steps in jhoom cultivation? Describe them in your own words.*
11. *What are the difficulties that have recently arisen in practising jhoom farming?*
12. *In the Eastern Himalayas, is there more soil erosion in terrace farming or jhoom farming? How is erosion minimized in each method?*
13. *Why is jhoom farming not practiced widely in the Western Himalayas?*
14. *Write three questions about the Himalayas for which you cannot find the answers in this chapter. (You need not write answers to these questions. Maybe in future you can think of a way to find the answers.)*

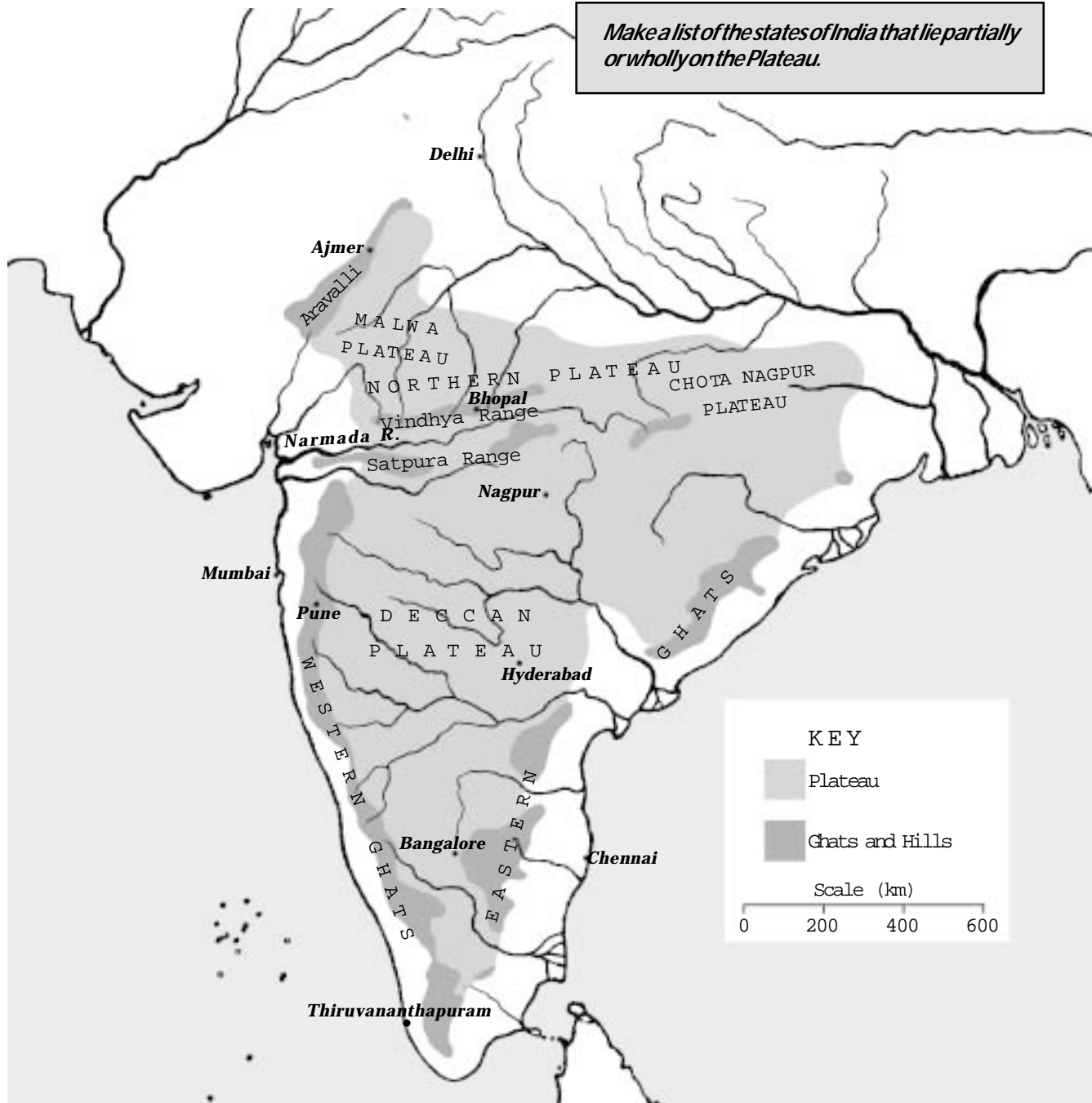
## CHAPTER 14

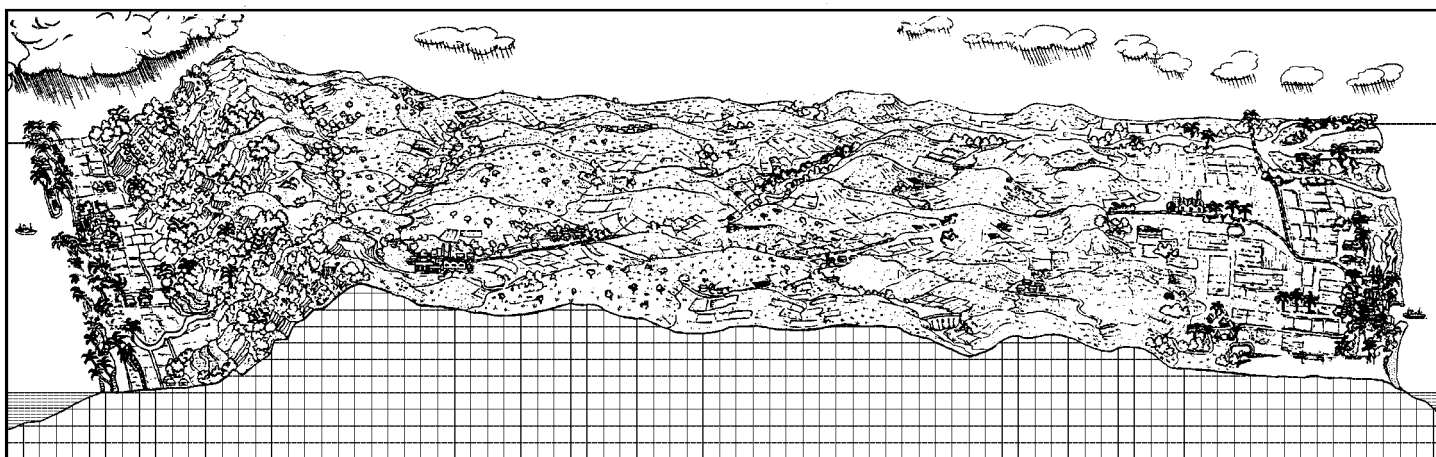
# INDIA'S PENINSULAR PLATEAU

The Peninsular Plateau is a vast area stretching over much of India. It consists of undulating land, which is somewhat higher than the coastal plains to the east and west or the flat Northern Plain of the Ganga and the Satluj. Look at a 3-dimensional plastic relief map of India to get a better idea of the Peninsular Plateau.

The large part of the plateau lying to the south of the Narmada River is called the Deccan Plateau. The part to the north of the Narmada is called the Northern Plateau, which is divided into the Malwa Plateau in the west and the Chota Nagpur Plateau in the east.

*Make a list of the states of India that lie partially or wholly on the Plateau.*





Arabian Sea  
West

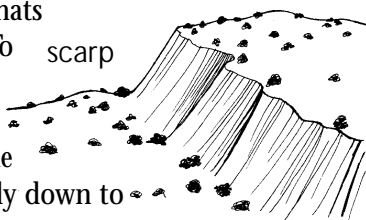
Western Ghats

Deccan Plateau  
A cross-section of the Deccan Plateau

Eastern Ghats

Bay of Bengal  
East

The Peninsular Plateau is surrounded on all sides by low-lying plains. Much of the Plateau is bordered by sloping scarps or ghats. On the western side, the scarp of the Plateau is very steep. To the east, river valleys divide the ghats into small hilly areas. To the north there is a scarp at some places and at other places the land just slopes gently down to the Northern Plains.



*The above picture is a cross section of the Deccan Plateau. Do you see boats or ships on the seas to the west and the east? Which seas are these?*

*Spot the coconut trees, fields, rivers, hills, houses and roads in the picture.*

*Run your finger to climb up the scarp from the western coastal plain, cross the breadth of the Deccan Plateau, climb down the scarp to the Eastern Coastal Plains and reach the Bay of Bengal.*

*Look at a physical map of India that is coloured according to altitudes in order to answer the following questions:*

*Do all parts of the Peninsular Plateau have the same colour on this map?*

*Does the map show any parts of the Plateau that are below 500 metres in elevation? (If so, where?)*

*The highest point on the Peninsular Plateau is Anaimudi Hill. Where is it? How high is it, and how does this compare to the highest peaks of the Himalayas?*

### ***A Journey on the Deccan Plateau***

*Open your Atlas to a map that shows the detailed physical features (including elevation) of the south of India. Put your finger at Mangalore and move eastward on the road going to Hassan, Mysore, Bangalore, and Robertsonpeth, till you reach Chennai. You crossed different heights along this route.*

*Mangalore is on the \_\_\_\_\_ coast of India and Chennai is on the \_\_\_\_\_ coast.*

*From Mangalore until almost 80 kilometres east, the elevation (the height of the land) is between \_\_\_\_\_ and \_\_\_\_\_ metres above sea level. It takes two or three hours to travel these 80 kilometres by bus.*

*After going 80 km east of Mangalore the route starts climbing steeply from a height of 200 metres to almost 1000 metres above sea level. What colours are used to denote the different heights along this climb?*

*This is called the Western Ghat - the scarp of the Deccan Plateau. Look on a map of India to find the scarp all along the plateau from north to south. Start from the area around Surat and come south till the area around Thiruvananthapuram.*

*Some parts of the ghats are high - such as the Nilgiri hills, on which the famous hill station named Ooty is located. Find four other hills on the Western Ghats.*

*Go back to your route from Mangalore to Chennai. As you go eastwards from the ghats towards Hassan and Mysore do you climb down as much as you had climbed up? What is the elevation between Hassan, Mysore and Bangalore?*

*Describe the land as you move from Bangalore to Vellore. What is the elevation near Vellore? Notice the Javadi Hills to the right of your route to Vellore. How high are they?*



*Travelling from Vellore to Chennai, does the elevation go up or down? What is the height of land near Chennai?*

*The slopes and hills you cross before Vellore are the Eastern Ghats. You cross them to reach the eastern coastal plains. The Eastern Ghats are made up of several small hills separated by river valleys such as the Palar river that flows next to the Javadi Hills. Locate four other hills on the Eastern Ghats from the north to the south of the Peninsular Plateau.*

*The Eastern and Western Ghats merge in the area around the Annamalai hills. Locate them in the Atlas.*

### *A Journey on the Northern Plateau*

*To get an idea of the terrain of the Northern Plateau, study the route from Jabalpur on the Narmada River to Allahabad on the Ganges. Describe the elevation along the route, how it climbs up or down, and which hills and towns it passes.*

*When you move from Satna towards Allahabad you cross the edge or the scarps of the Northern Plateau to reach the Northern Plains of India.*

## The Soil of the Peninsular Plateau

The soil of the Peninsular Plateau is formed by the disintegration and decomposition of its rocks. The underlying bedrock structure of Peninsular India is made of extremely ancient and hard rock. The soil it has produced is called **red soil**, the reddish colour being due to the large amount of iron it contains. Much of the Peninsular Plateau, especially the southern and eastern parts, have this red soil. It is not very fertile, but yields good crops when fertilized with manure or chemical fertilizers.

The northern, western and central parts of the Peninsular Plateau are covered with **black soil**. It comes from the erosion of volcanic rocks. Millions of years ago volcanoes erupted in this area. Lava and ash spewed out of cracks and fissures in the earth and spread out over the entire region. This turned into layer upon layer of rock. This is how

much of the Peninsular Plateau and the Western Ghats was slowly built up. This area is called the **Deccan Traps**. Over the millennia, the rock has been eroding and wearing away, producing the fine black soil. The layers of volcanic rock can be seen on eroded slopes, especially in the Ghats.

Rainwater washes the soil away from the higher areas, particularly where there is little vegetation. Thus in many places there is only a thin layer of stony soil, with the bedrock quite close to the surface.

In low-lying areas and river valleys a thick layer of heavy, black soil collects. It is very fertile and heavy, retaining water and remaining wet long after a rainfall. Since it is good for growing crops like cotton, it is also known as 'black cotton soil.'

### Rivers

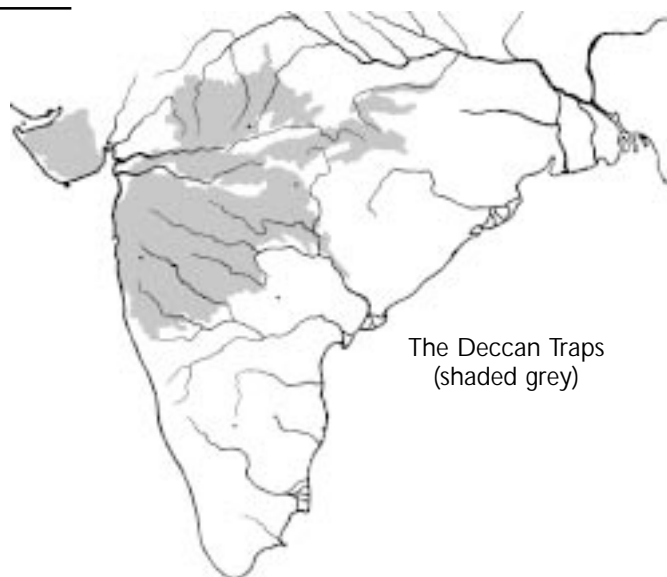
Many rivers emerge from the hill ranges. They create large flat low-lying areas of fine soil.

*Look in an Atlas and find out which rivers begin in which hills.*

#### **Hills**

*Aravallis  
Vindhyas  
Satpura & Mahadeo Hills  
Western Ghats  
Eastern Ghats  
Maikal Hills*

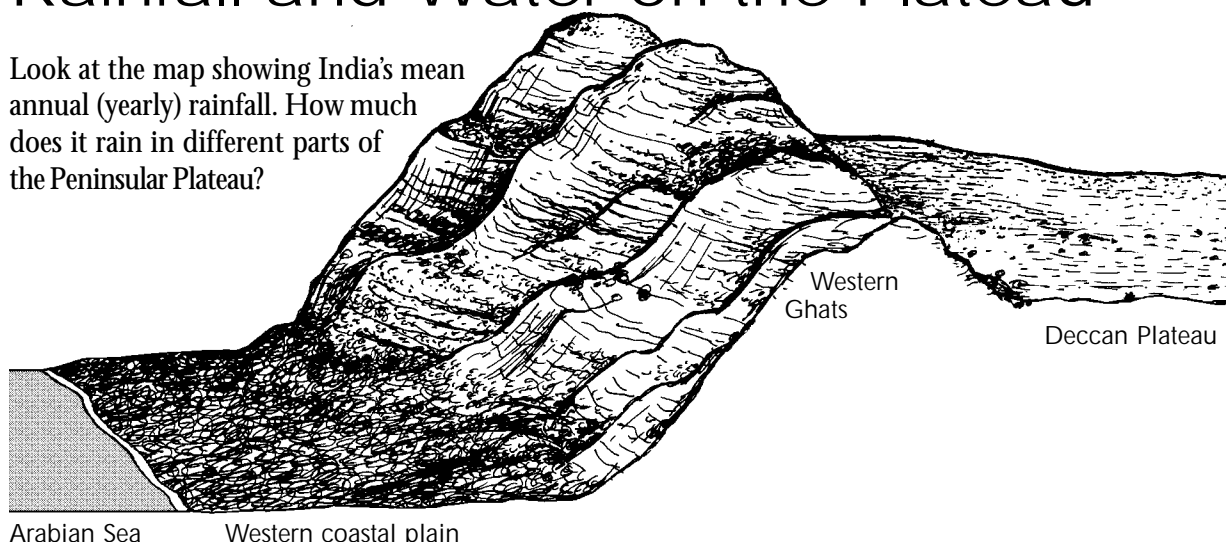
#### **Emerging rivers**





# Rainfall and Water on the Plateau

Look at the map showing India's mean annual (yearly) rainfall. How much does it rain in different parts of the Peninsular Plateau?



Arabian Sea Western coastal plain

*Compare the amount of rain that falls to the east of the Western Ghats with the amount of rain that falls to the west of the Western Ghats.*

Isn't it interesting? Why do the areas on either side of the Western Ghats get such different amounts of rain? The above picture and the following questions will help you find an answer (Refer to page 139 before you begin).

*When the wind blows from west to east, what happens to water that evaporates from the Arabian Sea?*

- (a) It disappears forever into thin air.
- (b) It goes to the east.
- (c) It gets carried along in the air as water vapour, blowing to the west.
- (d) Birds drink it all up.

*What happens to the wind when it blows east, towards the Western Ghats?*

- (a) The wind descends down.
- (b) The wind causes the end of the monsoon.
- (c) The wind stops blowing and the air and water vapour comes to a halt.
- (d) The wind has nowhere to go but up, and it carries the water vapour up also.

*Does air get warmer or cooler as it rises?*

*If warm, moist air gets cooler, what happens to the water vapour in the air?*

- (a) It evaporates.
- (b) It gets saltier.
- (c) It remains in the air.
- (d) It condenses, to form water droplets.

*Clouds consist of very fine droplets of liquid water, which form when the water vapour in air condenses. What happens if the clouds get cooler and its droplets of water get too big and heavy?*

- (a) The water droplets fall from the clouds as rain.
- (b) The water droplets evaporate.
- (c) The water droplets rise up.
- (d) The clouds hold on tighter to the water droplets.

*Where does the wind go after it reaches the top of the Ghats?*

- (a) It keeps rising up higher.
- (b) It turns around and goes back down the same way it came up..
- (c) It descends down on the other side.
- (d) It stays there.

*Does air get warmer or cooler as it falls?*

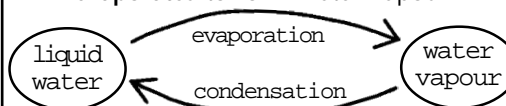
*Does the water vapour in air continue to condense if the air gets warmer?*

*A rain shadow is an area with less rain. Do you see how hills, such as the Western Ghats, create a rain shadow? Label the rain shadow area in the above picture of the plateau. Not only is the rainfall low in this area, it also*

*fluctuates from year to year. Some years there are fairly heavy rains, but then there may be hardly any rain at all for several years in a row.*

Condensation is the Opposite of Evaporation

When it gets warm, liquid water evaporates to form water vapour.



When it gets cool, water vapour condenses to form liquid water.

# Irrigation and Agriculture

Due to low rainfall the northwestern and central regions of the Peninsular Plateau depend on irrigation for agriculture. However, irrigation is very difficult because the ground water is buried deep below many layers of rock. To reach the ground water, people have to blast tube wells through metres of hard rock, and there is still no guarantee of getting water. Digging wells is therefore very expensive.

Since ancient times the people of the Plateau have built bunds to form large tanks in which rainwater is collected. They draw canals from these tanks to irrigate their fields. Such tanks can be seen in almost all villages on much of the Plateau. However, only a small area can be irrigated from each tank.

Another method of irrigation is to build large dams over rivers to make large water reservoirs. This water is taken to distant fields through a network of canals. In this way a very large area can be irrigated. Electricity can also be generated.

*Study your atlas and match each of the following dams to the river on which it is found:*

<i>Nagarjunasagar Dam</i>	<i>Mahanadi</i>
<i>Mettur Dam</i>	<i>Krishna</i>
<i>Hirakud Dam</i>	<i>Cauvery</i>
<i>Krishnarajsagar Dam</i>	<i>Chamba</i>
<i>Gandhisagar Dam</i>	<i>Cauvery</i>

However, building large dams has its drawbacks. It is not only very expensive, but it can also submerge large areas of fertile fields or forests. What happens to the people who are living in the areas that get submerged? Furthermore, digging canals through the uneven and hilly terrain of the plateau is very expensive. Even the fields have to be levelled before they can be irrigated. All this adds to the cost of large irrigation projects.

The Narmadasagar and Sardar Sarovar dams being built on the Narmada river are being strongly resisted

by the people who are insisting that the protection of the environment and the welfare of the displaced people needs to be given priority over the goals of increasing agriculture and industrial production.

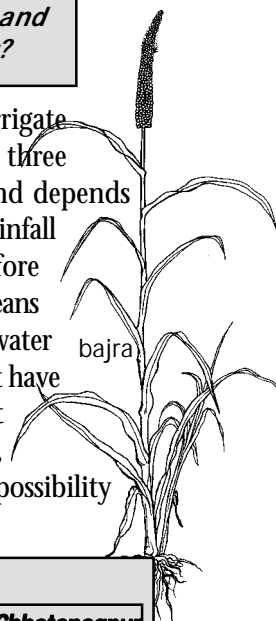
*Why is it difficult to dig wells in a plateau?*

*What are the advantages and disadvantages of irrigating with tanks?*

*What are the advantages and disadvantages of building large dams?*

Since it is difficult and expensive to irrigate fields in the Peninsular Plateau nearly three fourths of the land is not irrigated and depends solely upon rainfall. But as you know, rainfall in most of the Plateau is scanty. Therefore dry land agriculture is practiced. This means that farmers plant crops that need less water and can survive droughts. In places that have little irrigation and are solely dependent upon rainfall, failure of the monsoon, or its delay, means crop failure and the possibility of a famine.

bajra



## Main Crops

<b>Western Ghats &amp; Western Deccan</b>	<b>Eastern Deccan</b>	<b>Malwa Plateau</b>	<b>Chhotanagpur Plateau</b>

*Refer to an Atlas and fill in this Table to show where each of the following crops are mainly grown.*

<i>rice</i>	<i>jowar</i>	<i>coconut</i>
<i>wheat</i>	<i>barley</i>	<i>sugarcane</i>
<i>bajra</i>	<i>ragi</i>	<i>tea and coffee</i>
<i>cotton</i>	<i>oilseeds</i>	<i>spices (cardamom and pepper)</i>
<i>tobacco</i>		

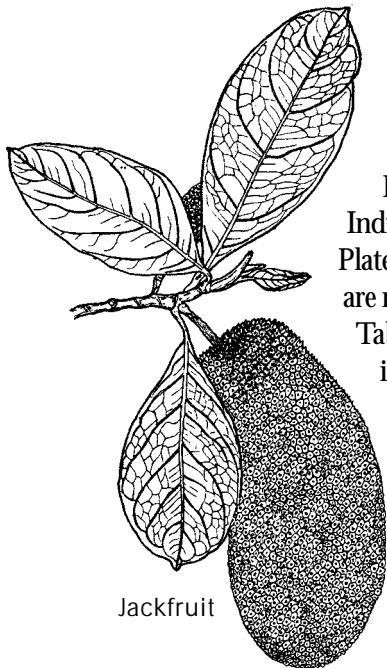
*Can you think of explanations for the cropping pattern that you see in the Table you filled up? It may not be easy because many factors influence the decision of what is grown in each place. What are the kind of questions that come to your mind in this regard?*

# Forests

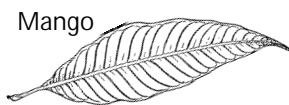
Look at the map showing the forest cover in India. You will find that many parts of the Peninsular Plateau are covered with forests. But, all these forests are not of the same kind, as shown in the following Table. The leaves, flowers and fruits of some of the important trees from the different areas are shown here.

**Types of Forests**

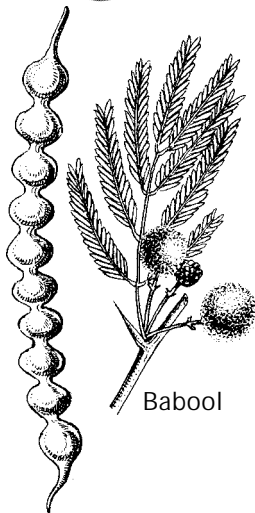
Western Ghats	Central Deccan	Eastern Deccan
<b>evergreen</b>	<b>Dry scrub</b>	<b>deciduous</b>
kadam haldu mango sandal	babool bael palm	sal teak



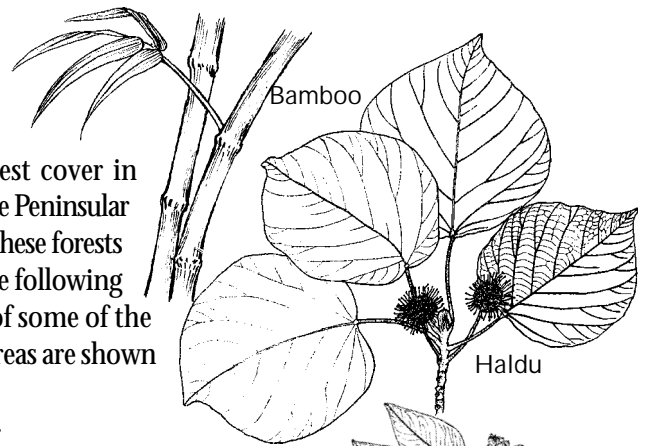
Jackfruit



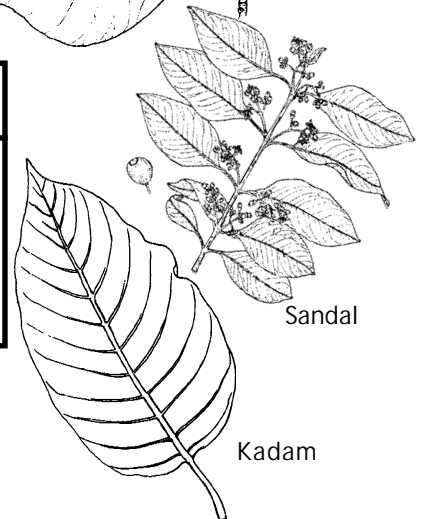
Mango



Babool



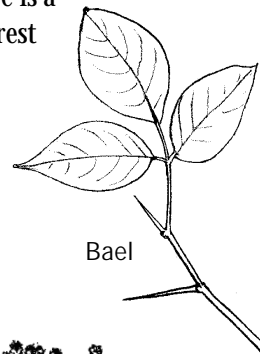
Haldu



Sandal

An **evergreen** forest is one in which the trees do not shed all their leaves in any one season, so the forest remains green throughout the year. An evergreen forest usually has a large variety of trees and some of them are very tall. Besides this there is a lot of other vegetation, making the forest quite dense.

*Can you think of any other distinguishing feature of such forests which you may have read about earlier?*



Bael

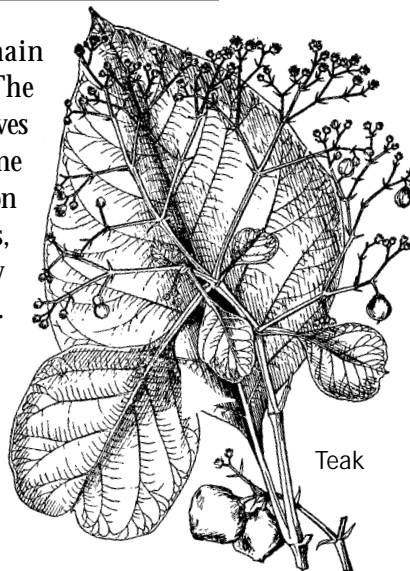


Rosewood

In a **deciduous** forest the trees remain without leaves in a certain season. The deciduous trees in this region shed their leaves at the onset of summer and they become green once again by the time the rainy season begins. Compared to evergreen forests, there are fewer varieties of trees and they are not as tall. The forest is also less dense.



Sal



Teak

*Try and identify what kind of forest is grown in high, medium and low rainfall areas.*

*Name some evergreen and some deciduous trees that you have seen growing in your area. At what time of year do the deciduous trees you have seen shed their leaves?*

# Mining

Many metals such as iron, aluminium are found as minerals in combination with other elements. When a mineral is found in sufficiently large quantities, so that mining is profitable, then it is referred to as an ore. An ore has to be processed, i.e. crushed, washed and chemically treated and smelted to get the metal.

*Look in your Atlas to find out what are the main regions (Coastal Plains, the Peninsular Plateau, Northern Plain, Himalayas or Thar Desert) where each of the following minerals are found.*

<i>Coal</i>	<i>Manganese ore</i>
<i>Iron ore</i>	<i>Limestone</i>
<i>Bauxite</i>	<i>Petroleum</i>

You can see that most of the mineral wealth of India is to be found in the Peninsular Plateau. Many of the areas rich in minerals are also thickly forested and inhabited by adivasis. Adivasis had been making use of these minerals even before the British ruled India. They used the iron ore found on the surface to prepare good quality iron and steel.

When the British established their control over this region, they surveyed the mineral resources of the area and opened many mines. After India became independent a large number of new industries began to be set up. These required large quantities of minerals. As a result many new mines were opened in the forest regions of the Plateau. These days mining is a major occupation there.

How are ores of minerals mined? Who are the

labourers who work in these mines? Under what conditions do they work under the ground? What kinds of changes are occurring these days in the way mining is done? In order to find answers to these questions, a number of years ago my friend and I went to Parasia, a famous coalfield of Madhya Pradesh.

## The Coalfields of Parasia

We boarded the Pench Valley Passenger from Itarsi railway station. This train goes from Bhopal to Chhindwara. Parasia is in the valley of the Pench river in District Chhindwara. That's why the train is also named the Pench Valley Passenger. There are huge deposits of coal in the valley of the Pench river and there are several coalmines there.

On reaching Parasia we were received by our friend Ganga Prasad who works as a miner in one of the coalmines. He had promised to show us the mines.



The mining town of Parasia, Madhya Pradesh

Parasia is a small town mainly inhabited by traders and officers and clerks managing the mines. As you go out from the town, you can see the mines, around which are settled the tenements of the miners. These settlements have their own names, like Newton Chikhli, Chandameta, and Ravanvada.

Ganga Prasad told us that for miles around the whole area, there is coal in the ground below. Mines have been dug at different places to extract this coal. I was really surprised when he told us that right below our feet, at a depth of some 30 to 60 metres, miners were digging coal and sending it to the surface.

"See that tall structure over there - that's the entrance to the mines," said Ganga Prasad. "This is the mine I work in. Come on, I'll have a pass made for you and take you down into the mine."

## Preparing to Enter the Mines

We had a pass made by the manager of the mines. Before being given a pass we were asked to sign a statement. It said that we were entering the mine of our own choice, and if there was any accident there, we could not hold the managers of the mine to be responsible. When I wrote my signature on this paper, suddenly I felt very afraid. What would we do if something went wrong down in the mines?

"There is nothing to be afraid of," Ganga Prasad reassured us. "Right now there are hundreds of people working below. Nothing will happen if we are careful."

Then we went to a room which was marked with a sign saying, 'Lamp Room.' There we were given a torchlight with cells, a steel helmet and a rod. Ganga Prasad explained, "It will be pitch dark down there, and we'll need these lights to be able to see. Sometimes in the mines a loose rock or stone can fall, or our head may hit against a low roof. That's why we wear the helmets to protect ourselves. We also attach the lights to our helmets."

We reached the entrance of the mine. Actually this is a lift that carries people in and out of the mine. Eight to ten miners stood waiting for the lift - helmets on their heads, a light in one hand and the



The entrance to the mine

rod in the other. All had thick boots on their feet. Each of them also had a basket and shovel.

## Inside the Mine

After some time a box which looked like a cage came up. This was the lift. Some miners emerged from it - covered with coal dust and looking like dark ghosts. We went and stood in the lift in their place. The gate of

the lift was drawn shut and it started descending, at first slowly and then very rapidly. It began to seem as if we were falling into pitch dark - into 'hell' itself. I felt very scared. After some time the lift slowed down and at last came to a halt. There were some lights where the lift had stopped. A man came and opened the gate and we came out.

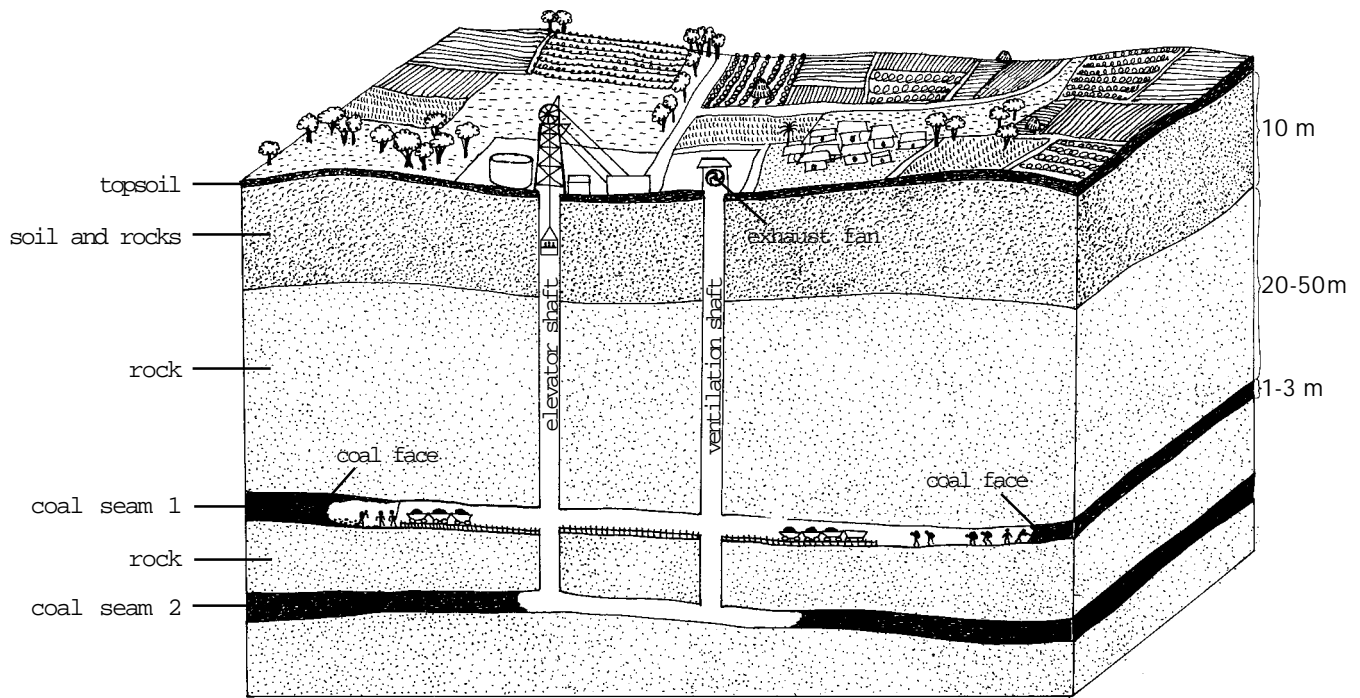
I was feeling very cold down there. I said, "How come it's so cold? I was under the impression that it would be very hot here."

"We'll explain that later. First stand aside - see, trolleys carrying coal are coming this way," Ganga Prasad said. We had been standing on rail tracks. Four or five trolleys were coming towards us on the tracks. They were loaded with coal. One of the trolleys was loaded on to the lift, which then went up. Now we began walking into the tunnel of the mine.

## The Question of Safety in the Mines

"This tunnel has been made by cutting out the coal," Ganga Prasad explained. "There is rock above and below. But on both sides there is coal."

"So there is rock above! Heavens! We'll be smashed if it falls on us!" I exclaimed.



**An Underground Mine:** Do you see the elevator shaft through which the miners go in and out of the mine? Coal is carried by rail and sent up the elevator. Air goes in the elevator shaft and goes out the ventilation shaft.

"That is a very real danger in working in the mines," one of the miners walking with us said. "Sometimes the roof does fall suddenly! Then the miners working below get buried in the debris. Or the debris could block the tunnel that leads out of the mine. Then people can get trapped inside and slowly die of suffocation, thirst or hunger."

Listening to all this as we walked along sent shivers down my spine. Ganga Prasad said, 'Many wooden pillars and beams have been placed throughout the tunnel to prevent such accidents. The pillars support the roof. As soon as the coal is dug out, pillars are placed in the tunnel to support the roof.'

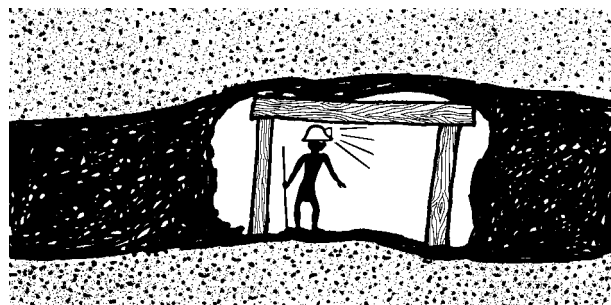
I was staring at those pillars when suddenly I heard the sound of running water. In a moment I saw that water was leaking from the walls and roof and in fact flowing like a rivulet on the floor of the tunnel. I was startled. I asked, "What's this water doing here?"

"When we dig a well, don't we find water? It is the same water - this is ground water," Ganga Prasad explained.

After walking for quite some time we reached the face of the mine. The 'face' is the place where the coal is presently being dug. There was so much heat and moisture near the face that the miners and I were soon bathed in sweat. It felt as if we were inside a furnace.

"Now you feel hot, don't you!" Ganga Prasad said. "In the other parts of the mine it was cool because air was flowing there. The shaft with the lift in it also brings fresh air into the mine. There is another shaft with a very large fan that sucks out the warm air from below. This maintains a supply of fresh air in the mine and it also remains cool. That's also why we don't feel suffocated. But at the face, there isn't enough space for much air to flow, so that's why we feel hot here."

Wooden pillars and beams are placed inside the mine to keep the tunnels from caving in





## Blasting the Coal Out

I began to observe the work at the face. Two or three miners were drilling deep holes into the wall. Ganga Prasad explained that the coal would be blasted off with dynamite.



A long drill is used to make a hole for the dynamite

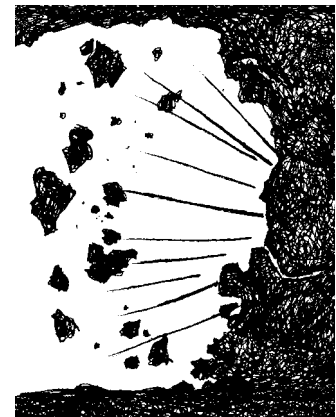
After 8 to 10 holes had been made they were filled with explosives.



Preparing dynamite sticks for blasting the coal out

A bell rang to remind everyone to clear out of that area. Then there was a whistle. Suddenly the whole mine resounded with the boom of an explosion. The walls and the ground shuddered. It seemed as if an earthquake had hit the spot!

After some time the whistle sounded again and we moved once more towards the face. A cloud of black dust had gathered there. Slowly, the dust settled. Coughing in the dust, two or three miners entered the cloud. They walked over the coal that had fallen in the explosion, using their rods to inspect the places from where the coal had fallen. At one spot the roof was weak, so it was supported with posts.





## Filling the Coal into Trolleys that Carry it out of the Mine

Meanwhile six or seven miners came with baskets and spades. Ganga Prasad and I also went along with them. Their job was to fill the trolleys with coal. This was a lot of hard work. In the terrible heat of the face they had to fill their baskets with the heavy coal that had fallen in the blast, and carry it on their backs some 50 meters to dump it in a trolley. Then they had to come back for another basketful - not an easy task at all.



Carrying a heavy basket of coal to the trolley . . .  
In some places the roof of the tunnel is so low that the miners cannot stand up straight

I was not able to take more than two baskets, and I watched Ganga Prasad and the other miners in amazement.

They said, "What, tired already? And every miner has to fill at least three such trolleys every day. If we fill more than this, we get paid extra money. So we usually fill some 10 to 15 trolleys in a day."

When five trolleys had been filled a supervisor came and noted it in his notebook. Then he sent a signal through a switch fixed on the wall, and a steel cable began pulling the trolleys away.

## The Chasnala Mine Disaster

Taking a breather, the miners sat down in a corner. There was too much water below so I sat on a piece of coal. One of the miners said, "This water that you see is very dangerous for us. Let me tell you. A horrible accident happened some years ago in a mine called Chasnala in Bihar. The miners were working in the mine. There was an empty mine nearby that was filled with water. Somewhere a wall of coal suddenly collapsed and the water from the

abandoned mine rushed in like a flood. Before anything could be done, more than 400 miners got drowned in minutes."

"Oh, all that happened in the old days," another miner said. "In those times mines were run by contractors or private companies. After 1973, the government has taken all the mines into its own hands. Now there is more emphasis on safety. Earlier the owners only wanted more production. They were hardly bothered about the safety of the mines and the miners. Roofs collapsing, flooding, air fans stopping - all these things used to be very common."

"But even now there is carelessness," Ganga Prasad said. "In the rules it is written that after each explosive blast water should be sprinkled around to prevent the dust from hanging in the air. But who does this? The dust keeps flying, and with every breath we get specks of coal into our lungs."

By this time more empty trolleys had come, ready to be filled up, so the work began again.

## Workers from Outside

In the afternoon we went to Ganga Prasad's quarters. After some food and a little rest, we went to meet some other miners. I found out that most of the labourers here are from eastern Uttar Pradesh and Bihar. Out of a thousand, almost 600 are from outside and only 300 to 400 are local people. I was very surprised.

Ganga Prasad explained, "You see, when these mines were opened during British times, the adivasis of this region refused to work in the mines. So the company people would bring labourers from Uttar Pradesh and Bihar on yearly contracts."

"Why do you people leave your homes and families to come so far away?" I enquired.

"What else could we do?" he replied. "The big farmers had taken up all the land there. We had very little of it. Our family was large. We were totally sunk in debt. So I thought I'd earn a little bit here and if nothing else, at least I would be able to get my pledged land back. When I came here I thought of returning after a year or two. But I ended up just staying on in the mines."

When the mines were nationalised, that is, when the government took over the mines into its own hands, then the jobs of the miners were made permanent.

*These days there is a move towards **privatising** many industries once again. The government may allow private companies, including foreign companies, to take over some of the running of mines. Why do you think the miners are protesting this move?*



Ganga Prasad's colony, where we spent the night

## Illness and Leave

One other miner said, "Our families continue to live in our villages back home. Every year we take leave to go home."

"But how much leave do you get?" I asked.

"In a year we get 15 to 16 days of leave," he said. "But when we go to the village we stay for a month and a half or two. This means our wages are cut, but then what to do? It's not possible for any miner to be able to work round the year in the mine. They fall ill."

I had observed that the miners would keep coughing all the time. When I asked about it one of them said, "Well, you saw how much coal dust there is below. We work in that dust, which spoils our lungs. We have breathing problems. They call it, 'black lung disease'. Doing even a little bit of work leads to breathlessness."

"Can't this be treated?" I asked.

Another miner spoke up, "Black lung disease has no treatment. Actually, the law says that those who get black lung disease should get compensation of Rs 30,000 - 40,000. But the company's doctors refuse to give us a certificate showing that we have this disease. That is why we often don't get compensation."

*Why do those who enter the mine have to take torchlights and helmets?*

*How do the miners prevent the roof of the mine from collapsing?*

*How is warm air removed from a mine?*

*How is coal extracted from the wall of the mine?*

*Of all the tasks that the miners do, which one do you think is the most difficult and dangerous?*

*How did the Chasnala disaster take place?*

*What are the symptoms of black lung disease?*

*Why do the miners have to take extra leave without pay?*

The next day we went to see an open pit mine. Here there are no tunnels. Coal is removed by digging huge pits in the ground. Soil and rocks are removed in order to take out the coal underneath. Come, let's see how this is done.

## Open Pit Mines

When we arrive, we see that some land is being surveyed. The government is going to buy the land from the owners of these fields.

Then we see the huge pit that has been dug to expose the layer of coal.

In the open pit mines almost everything is being done by machines. A bulldozer is being used to remove the soil.



These fields would soon be dug up to find coal

A few workers standing near a bulldozer deep down in a pit





Rocks are being blasted with explosives to release the coal. Huge power shovels and front-end loaders are used to dig out the coal and load it into trucks.



A worker using a bulldozer to clear soil in a pit mine

The debris is also being put into trucks that take it out of the pit, where it is dumped. Big hills of this debris grow outside the mine.



A large power shovel scrapes up a load of coal (above) and dumps it in a truck (below)



The truck then takes it up out of the pit



Since so many machines are used, just 4 or 5 workers take the place of thousands of workers in the underground mines. Thus, open pit mining is cheaper because there are fewer workers to pay.

But there are many problems with this kind of mining. The first is that the machines have to be brought from foreign countries.

Often these machines break down and lie idle because spare parts are not available.

Secondly, since these machines are used, people's jobs are being taken away. The miners said that in the last 20 years production has increased many times over, but hardly any new miners have been hired. Many miners are unemployed.

Thirdly, and perhaps most important, the environment is damaged by digging the pits. The debris is piled over an even larger area than is taken up by the pits. Thus, fields and forests for kilometres around are destroyed. The fertile part of land is just the thin layer on top - the 'topsoil.' When the topsoil is dug up or buried, the land is wasted. It can't be used for farming.

"What's happened to all the people who used to have their fields here?" I asked.

One of the miners said, "I used to have my field here. When they came to know that there is coal below the ground here, I had to give up my land to the government. In return for it I was given this job and some money as well. But we didn't want to give up our fields. This land was very fertile."



Huge hills of debris from the pit rise up all around

Another miner said, "In these mines all the high paid jobs are given to people from outside who are more educated. We remain with the low paid work and even that is now threatened by mechanisation."

After talking with the miners for some time I got a ride on a truck carrying coal. The trucks carry coal to the point where it can be loaded onto trains.

I asked the truck driver what would be done with so much coal.

A front end loader dumps coal into the rail bogeys



"Well, the trains take the coal to the thermal power house at Sarni to make electricity," the driver replied.

By this time we had reached the place where the coal was being loaded onto the trains. The truck went up to the top of a mound of earth and stopped. A train stood below. All around there was coal dust in the air. Everybody who was there had covered their nose, ears and mouth with cloth. I also followed their example. When the driver raised the tipper, the coal fell straight into the train standing below.

So this is what I saw on my journey to Parasia. I returned that night, taking the Penchvalley Passenger again.

Many of the underground mines in Parasia are being closed down in recent times because most of the coal they contained has been mined out. Underground mines are not as profitable as open-pit mines. So nowadays 70% of the production of coal in India is from open-pit mines.

*Why are open mines cheaper to operate than underground mines?*

*What are the damages caused to forests and fields by open mines?*

*What is the coal that is mined from Parasia used for?*



## Heavy Industries on the Deccan Plateau

We saw how coal is mined in the Deccan Plateau. Apart from coal large quantities of the other minerals are also mined here, and are used in industries making iron, steel, cement and aluminium.

### Mineral

iron ore  
manganese, coal, iron  
limestone  
bauxite

### Used to Make

iron  
steel  
cement  
aluminium

To run industries, electricity is needed. Since plenty

of coal is available to make electricity, there are many thermal power stations on the Plateau. Electricity is also produced by water-powered generators at big dams.

Thus, due to the easy availability of raw materials and electricity, there are many metal-based industries here.



The location of these industries close to mining sites reduces the cost of transporting heavy mineral ores. The steel, aluminium and cement manufactured in the Plateau region are transported by rail to large industrial cities such as Kolkata, Mumbai and Chennai. Or they are taken to harbours where they are shipped to other places.

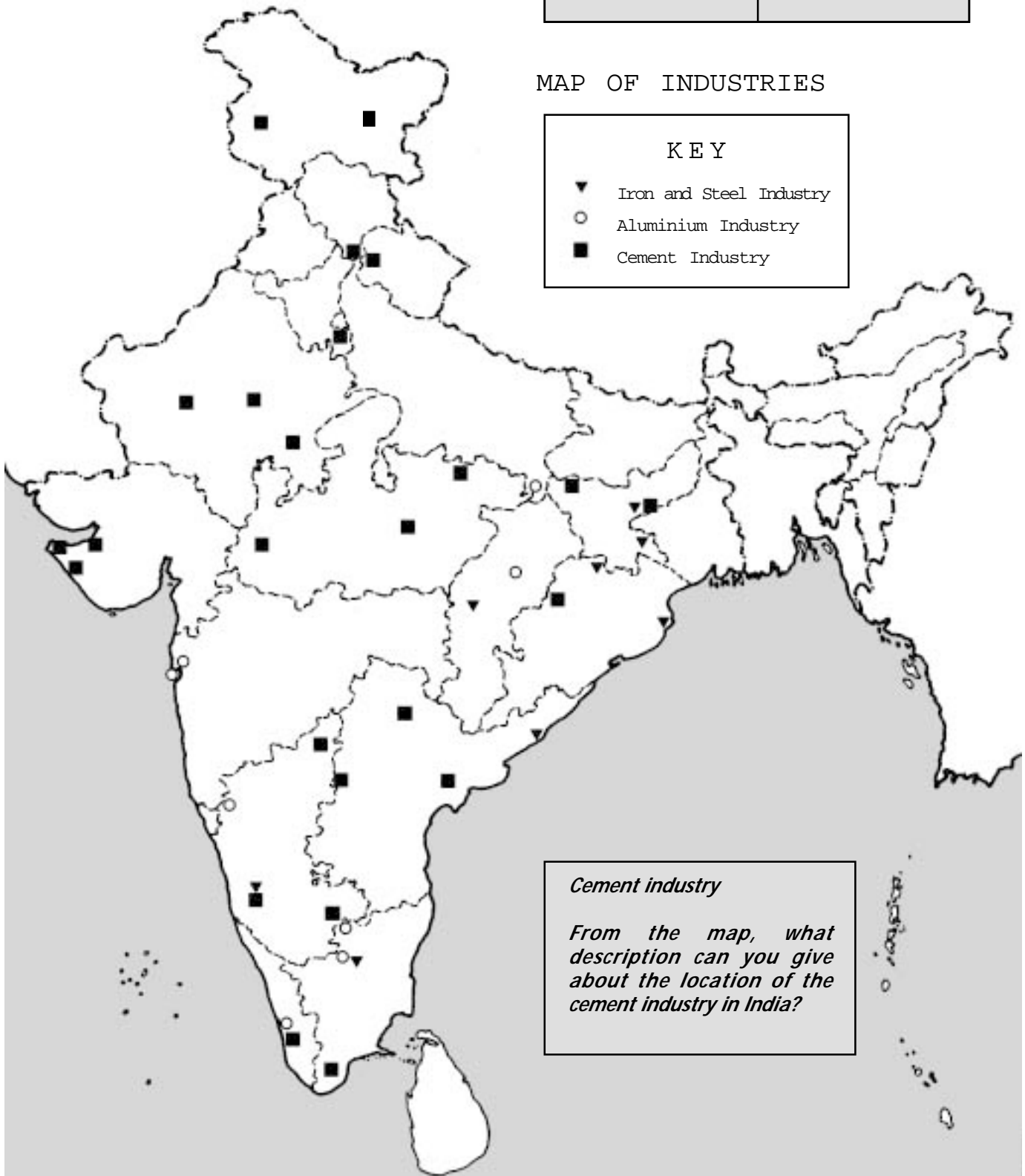
*Look at the map and fill the Table to show in which states each type of industry is located:-*

<b><i>Industry</i></b>	<b><i>Located In</i></b>
<b><i>Iron and steel industry</i></b>	
<b><i>Aluminium industry</i></b>	

## MAP OF INDUSTRIES

### KEY

- ▼ Iron and Steel Industry
- Aluminium Industry
- Cement Industry



### ***Cement industry***

*From the map, what description can you give about the location of the cement industry in India?*



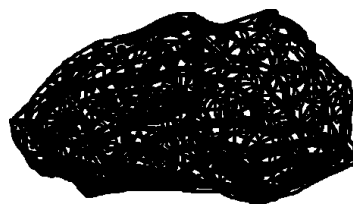
***Why is the iron and steel industry located only in certain regions of India?***

Many industries not based on metals and minerals are also found in the Peninsular Plateau. These are based on the crops grown in the fields and plantations. You can try and deduce what kind of

agro-based industries can flourish in different parts of the Plateau.

***Think of four agro-based industries of the Plateau and check in the atlas if your guesses are correct.***

Besides agro-based industries, information technology (IT) industries are also developing in



large cities such as Bangalore and Hyderabad.

***Use your atlas and name five thermal and five hydro-electricity plants in the Peninsular Plateau.***

### **Do Rocks Burn?**

Here is a piece of coal that is burned as fuel in a power plant. It looks like a rock doesn't it?

Actually it is a special kind of rock that is made from plants. Here's how:

Millions of years ago some plants in swamps died and were covered with water. Without exposure to oxygen, the plants decayed to form soft, black, carbon-rich 'peat bogs'.

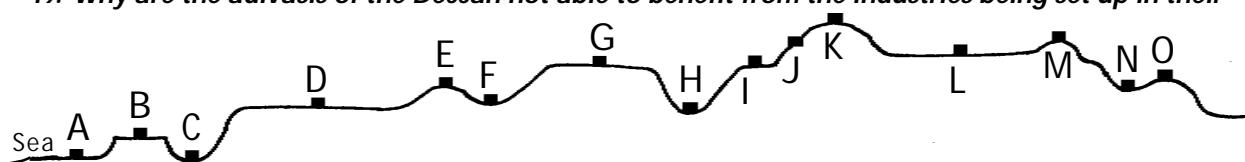
Then the peat bogs got covered by silt and sand.

As millions of years went by, more layers of soil accumulated, and they pressed down on the layer of plant material. There was so much pressure that the plant material got compressed and hard. It became fossilised - formed into rocks - called **coal**!

## Exercises

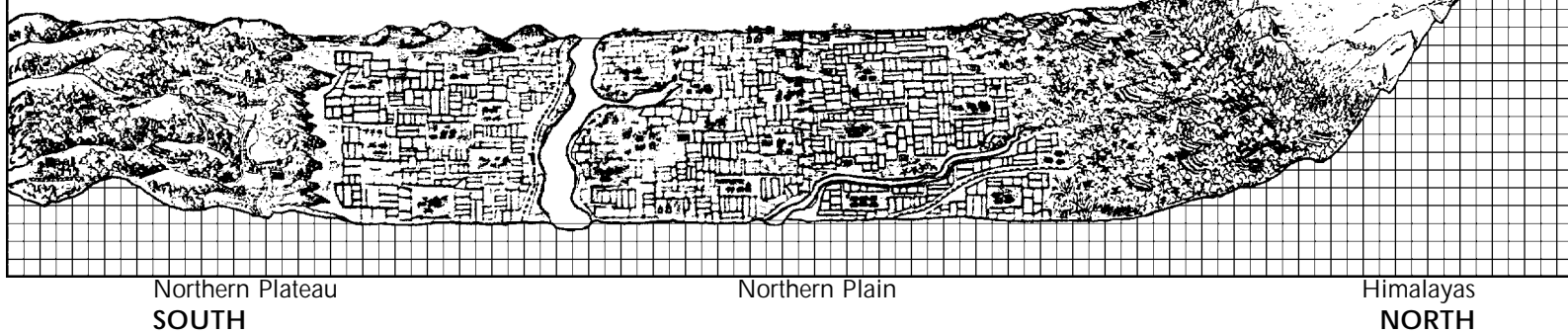
- 1. Look at the rivers that flow through the Deccan Plateau. Which way do they flow? (Remember that rivers can't flow from the sea to the hills!) Based on the direction of flow of the rivers, tell which of the following is true:**
  - a) The Deccan Plateau slopes from east to west.**
  - b) The Deccan Plateau slopes from west to east.**
  - c) The Deccan Plateau does not slope.**
- 2. Which way do the rivers of the Northern Plateau flow? Which of the following is true:**
  - a) The Northern Plateau slopes from the south to the north.**
  - b) The Northern Plateau slopes from the north to the south.**
  - c) The Northern Plateau slopes from west to east.**
  - d) The slope of the Northern Plateau is the same as the slope of the Deccan Plateau.**

3. In some parts of the Peninsular Plateau there is deep soil while in other parts there is light or rocky soil. What are the reasons for these differences?
4. Why is there less rainfall on the eastern than on the western side of the Western Ghats?
5. Why is irrigation difficult on the Peninsular Plateau?
6. In which part of the Peninsular Plateau is more rice grown? Why?
7. In which part of the Peninsular Plateau is more jowar grown? Why?
8. Which part of the Peninsular Plateau would you expect has colder winters - the areas around Hyderabad, Nagpur or Gwalior? Find these cities on a map and give an explanation.
9. Look at the appropriate map and tell which parts of the Peninsular Plateau have the least amount of forests. Referring to other maps, give two reasons why those parts have fewer forests.
10. Before the British came, how did the adivasis of the Plateau use the minerals found there?
11. What are the dangers that miners in coalmines have to face?
12. Why did farmers of Uttar Pradesh leave their villages to come and work in the Parasia mines?
13. What use is made of the coal that is taken out from the Parasia mines?
14. Find out the name of at least one city or town that is located in each of the following regions. In case you have been to any of these places, tell your classmates about it.
  - a) The Deccan Plateau
  - b) The Malwa Plateau
  - c) The Narmada River Valley
15. Compare open pit mining to underground mining. What are the advantages and disadvantages of each type of mining?
16. What do you think are two demands that adivasis living around Parasia might make in order to improve their living conditions?
17. What is the difference between evergreen forests and deciduous forests?
18. Read the section 'Development and Problems in the Northeast' in Chapter 13 and compare the situation of adivasis of the Deccan and those of the northeastern part of India?
19. Why are the adivasis of the Deccan not able to benefit from the industries being set up in their



## CHAPTER 15

# THE NORTHERN PLAIN



Identify the Northern Plain of India on a map of India's natural regions. Also find the Northern Plain on a plastic relief map if you have one. Run your finger across the Northern Plain on these maps to understand the full extent of its location.

*What are the natural regions that lie to the north and south of the Northern Plain?*

*The Northern Plain actually consists of the plains of three mighty rivers. Which are these three main rivers? Into which seas do they flow? Look in your Atlas to find out.*

*If you look at a map of rivers in India you will see that all the other rivers flowing in the Northern Plain are **tributaries** of the three main rivers. Name the tributaries of each of these rivers. Can you name any tributaries of tributaries?*

*Do any of the three main rivers flow through other countries besides India? Which ones?*

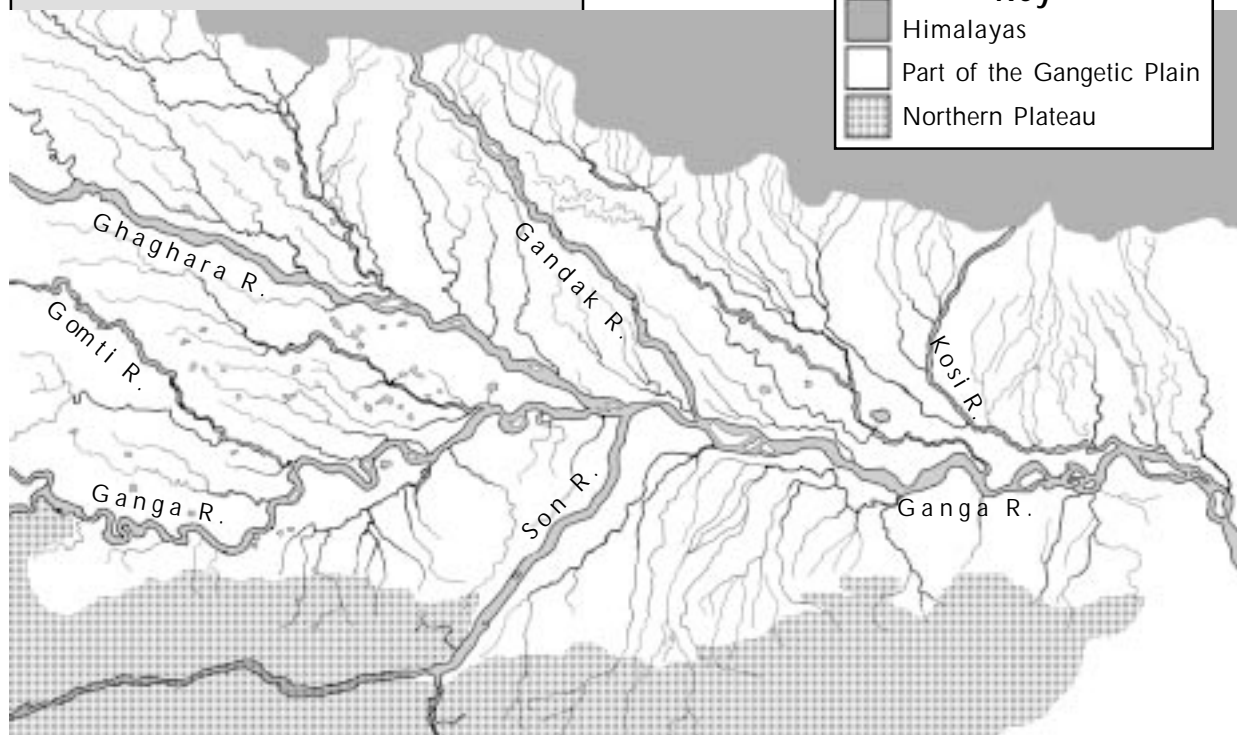
*A large part of the Northern Plain is also called the Indo-Gangetic Plain. Why is it called this?*

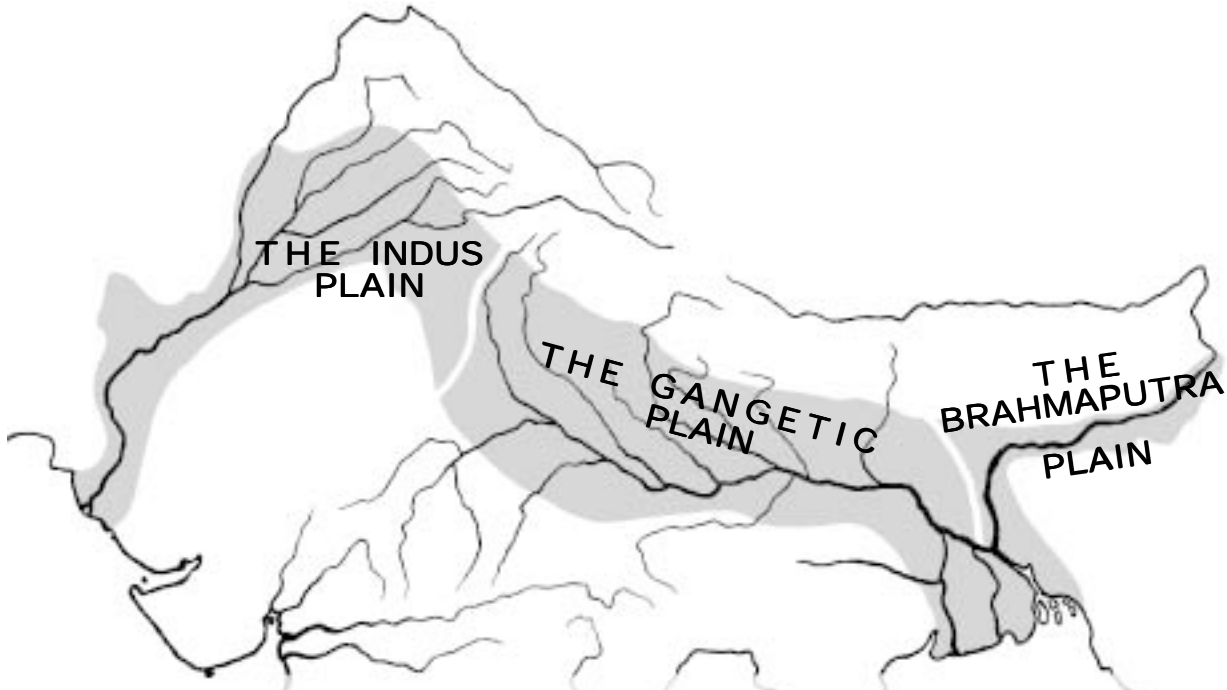
### A River Basin

The entire area through which a river and its tributaries flow is known as a **river basin**. The picture below shows part of the Ganga river basin which is flat, with very little slope. Notice how so many rivers and their tributaries make a network that covers the plain. The water comes from the snow on the Himalayas and from rainfall that falls in the basin.

#### Where does the water go?

All the water that flows in a river does not reach the sea. Much of it soaks into the ground, evaporates or is diverted for irrigation or other uses.





## The Three Parts of the Northern Plain

The Northern Plain in India is divided into three parts - the Indus River Plain, the Gangetic Plain and the Brahmaputra Plain. Some of the tributaries of these rivers are also included in the Northern Plain. However, note that the Northern Plain does not include the mountainous regions where the rivers begin (although these are also part of the river basins). Nor does it include the higher regions that are part of the Northern Plateau.

*Do you live in the Northern Plain or have you ever been there? If so, in which of the three main river basins?*

The three parts of the Northern Plain differ in many ways. The biggest difference is the amount of rainfall each part gets.

*Look at the rainfall map of India. Among the parts of these three river basins that lie in India, which gets the most rainfall and which gets the least?*

Another major difference is the crops grown in each part.

*Look at the maps in your Atlas that show major areas of wheat and rice cultivation and also those that show annual rainfall. Is more wheat or more rice grown in the areas with the highest rainfall? Which of these is grown in areas with lower rainfall?*

*Make a list of the states of the Northern Plain in which more wheat is grown. Then make another list of the Northern Plain states in which more rice is grown.*

## The Indus River Plain

*Look at a map and tell which states of India (or which parts of states) lie in the Indus River Plain.*

In most parts of the Indus River Plain farmers cultivate two crops a year and they get very high crop yields. The main crop is wheat.

*Besides wheat, what other crops are grown in the Indus River Plain? Use your Atlas to find out.*



You can see on the maps that there is less rainfall in the Indus River Plain than in the other two river plains. And yet, this region gets very high crop yields. How is this possible? Through irrigation!

Look at the map of irrigated regions of India and see how widespread the irrigation network is in this region. The major sources of irrigation are canals, wells and tube wells.

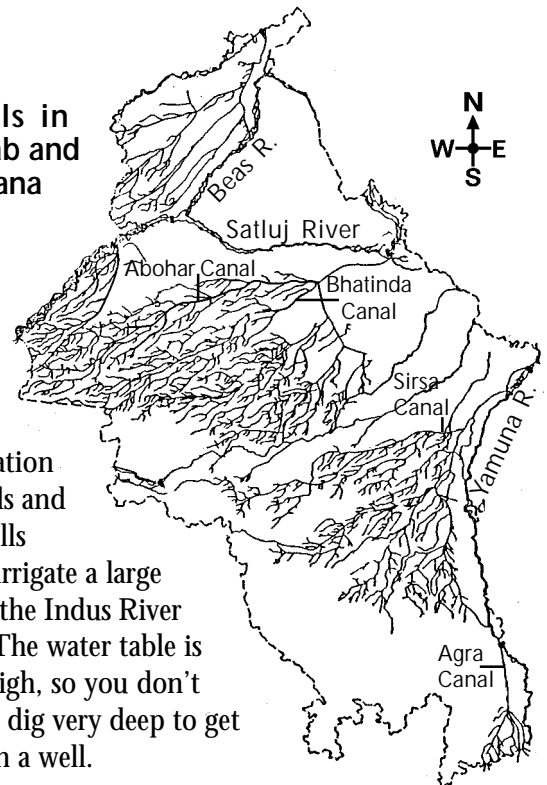
The Indus and its tributaries are **perennial** rivers, having water throughout the year.

*Why do these rivers have water throughout the year, even when the rainfall is low? Can you give some explanation?*

The water of these rivers is distributed over a very large area by canals. Since the land in the Indus River Plain is quite flat, it's easier to lay canals here than in many other areas. The river surface is almost level with the surrounding land. Also, the soil is alluvial, without much rock. Therefore long canals can easily be dug to take water to far off fields.

### Canals in Punjab and Haryana

The other sources of irrigation are wells and tubewells which irrigate a large area of the Indus River Plain. The water table is quite high, so you don't have to dig very deep to get water in a well.



*Would it be easier to dig a well in the area around Indore or in the area around Patiala? Explain. In order to answer this question, first look on maps to find out the characteristics of the natural regions of these two places.*

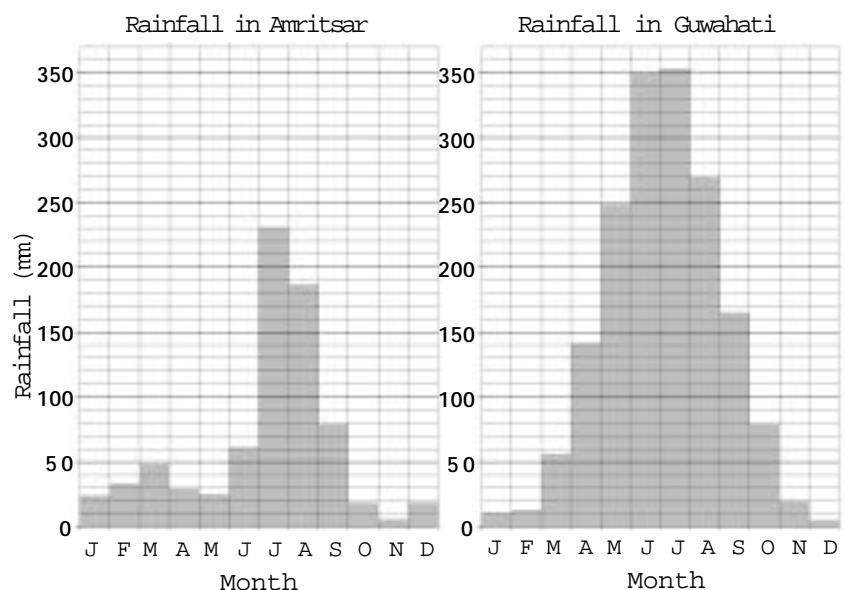
## The Brahmaputra Plain

*The Brahmaputra River Plain lies in which countries and which states of India? Look on a map to find out.*

*On the right are rainfall graphs of two places in the Northern Plain. Find their locations on a map and see which one is in the Brahmaputra Plain and which one is in the Indus Plain.*

*Make a list of the differences between the rainfall in these two places, as shown in the graphs.*

*In which of these places is more than one crop of paddy grown each year?*







Transporting bamboo from Meghalaya down a tributary to the Brahmaputra

We saw how many **tributaries** join to make the Ganga and Brahmaputra such huge rivers. In Bangladesh and West Bengal the waters of the Brahmaputra and the Ganga mix with each other. They divide into a number of **distributaries** and form a delta before flowing into the Bay of Bengal.

In some parts of this delta, water is so abundant that three crops of rice are cultivated every year. Irrigation is not needed. Another major crop in this region is jute, which also requires a lot of water.

## The Gangetic Plain

*Look at the maps in your Atlas to answer the following questions.*

*In which states of India is the Gangetic Plain located?*

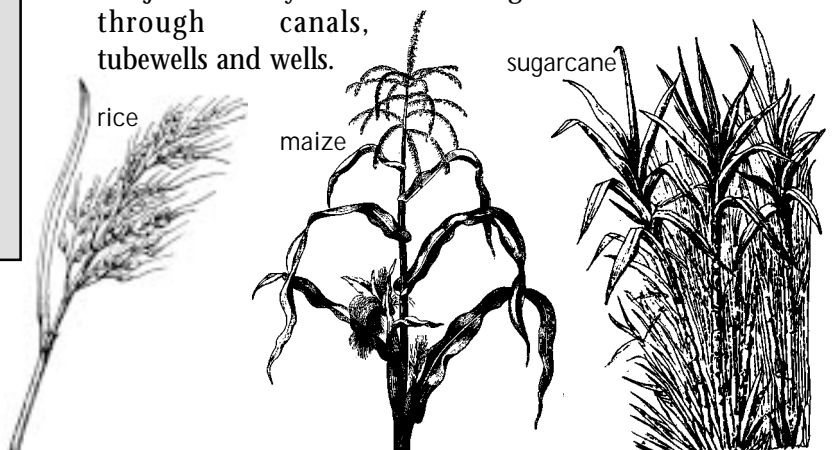
*What are the names of some of the distributaries of the Ganga?*

*Make a list of the crops cultivated in the Gangetic Plain.*

*Look at a map of annual rainfall and say whether the eastern or western parts of the Gangetic Plain get more rainfall.*

*What is the difference between the major crops of western and eastern Uttar Pradesh? What is the reason for this difference?*

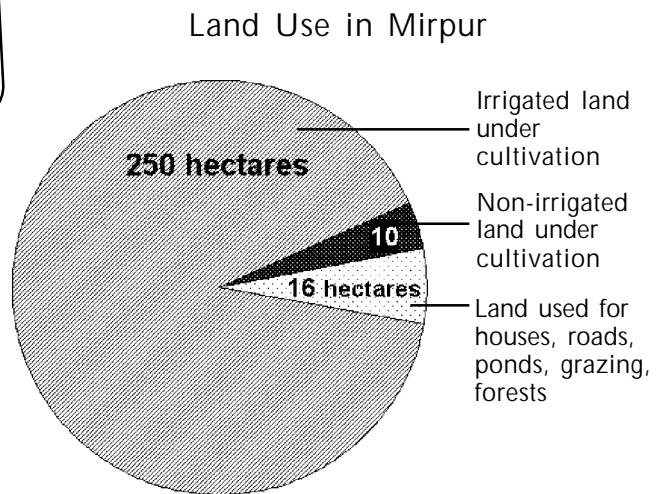
Western Uttar Pradesh is extensively irrigated, like Punjab and Haryana. Here too, irrigation is done through canals, tubewells and wells.



To understand the extent of use of irrigation facilities in western U.P., let's take a look at a village in this area.

### Land Use in Village Mirpur, District Bulandshahr, UP

Here is some information about a village called Mirpur in Bulandshahr district. Look in a map to see where Bulandshahr is. The total area of Mirpur village is 276 hectares. The following Pie Chart shows how this land is used.



*Look at the Pie Chart and answer the following questions.*

*How many hectares in Mirpur are used for houses, roads, ponds etc.?*

*How many hectares are under cultivation?*

*How many hectares in Mirpur are irrigated?*

*What percentage of the agricultural land of Mirpur is irrigated?*

*Now fill in these blanks:*

*Every nook and corner of the land is \_\_\_\_\_.*

*Most of the cultivated land is also \_\_\_\_\_.*



A large number of villages in western Uttar Pradesh make similar use of their land.

*Answer the following questions about the village you belong to (or visit a nearby village).*

*How many hectares of land are cultivated in your village?*

*Of this total, how many hectares are irrigated? What percentage of the cultivated land is irrigated in your village?*

*What are the similarities and differences between your village and Mirpur?*

*What are the reasons for such similarities/differences? Discuss this with your teacher and classmates.*

This photograph of a village in the Gangetic Basin was taken from an aeroplane. Trace the course of the tributary of the Ganga from the top left to the bottom right and find the following things in the photo: a dam on the river; the reservoir of water behind the dam, and canals that bring water to the fields.

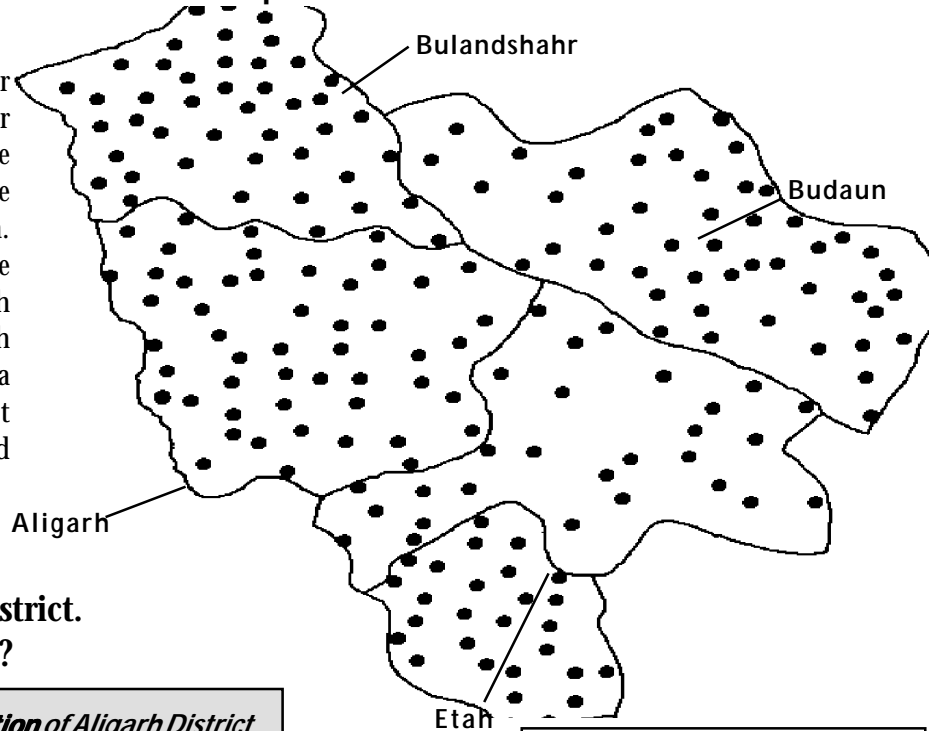


# Population Density in the Northern Plain

You have analysed and compared different areas in the Northern Plain. Now, work in groups of 4 or 5 to help each other learn about the population. Try to read this section, answering each question as it comes.

## The Rural Population in Four Districts of UP

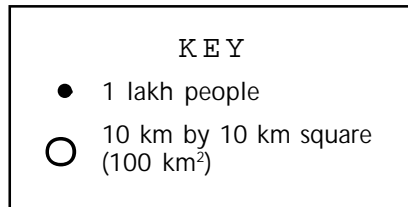
Here is a map of four districts in western Uttar Pradesh. They lie in the Northern Plain along the Yamuna and the Ganga. The dots on this map are not villages or towns. Each dot represents 1 lakh people who live in a number of different villages in the area around the dot.



**Look at Aligarh District.**  
**How populous is it?**

*Calculate the **population** of Aligarh District (how many lakhs of people live there).*

*Compare it with the population of the other three districts. Which district is the most and which is the least populous?*



**How big is it?**

*How many squares are there in Aligarh District? \_\_\_\_\_ (Put your heads together to figure out a way to approximate.)*

Each square on the map is 10 km long by 10 km wide. Then, each square is 100 square kilometres (which can be written: 100 km<sup>2</sup>).

*How many hundred square kilometres does Aligarh District have? \_\_\_\_\_ hundred square kilometres = \_\_\_\_\_ × 100 km<sup>2</sup>. In other words, this is its **area**.*

**How crowded is it?**

*Explain what you mean by crowded. Is it the same as how populous a district is? Is a large room of 10 people just as crowded as a small room of 10 people? Discuss different opinions in your group.*

It isn't easy to tell which district is most crowded just by looking. However, by following the procedure on the next page, you can calculate how crowded a district is.



In some places the Ganga River is more than 4 km wide. Can you imagine how useful so much water is?

## How dense is the population?

You can find out how crowded Aligarh District is by calculating how many people live in an average square in the map - that is, the number of people in each 100 square kilometres (in other words, people /100 km<sup>2</sup>, which can also be read as people per 100 km<sup>2</sup>).

*You already found the total number of people in the district and the total number of hundred square kilometres. So, just divide these two numbers to find out the number of people/100 km<sup>2</sup>. (Hint: since there are 1 or 2 dots in most of the squares in the map, your answer should be somewhere around 1 lakh people / 100 km<sup>2</sup> or 2 lakh people / 100 km<sup>2</sup>.) Check to see if everyone in your group gets the same answer.*

*If you divide this number by 100 you will get the number of people per one square kilometre. The number of people per square kilometre is the population density of the district. Calculate the population density of Aligarh district.*

*Look at a population map of India to see which natural region has the densest population. How can you tell whether the population is dense when you look at this map?*

Look at the graph showing the population density in different states of India.

*Which of the states in the graph has the most dense population and which has the least dense population?*

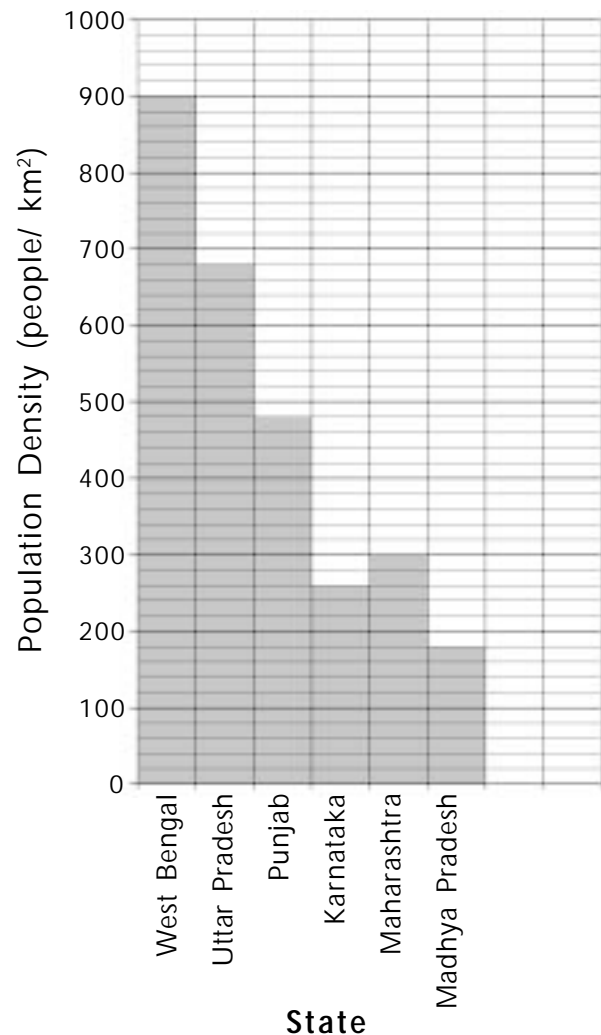
*Which of these states are mainly in the Northern Plain and which are mainly in the Peninsular Plateau?*

*Are the states in the Northern Plateau less densely populated than the states in the Peninsular Plateau?*

*What do you think are the reasons for the differences in population density between the Northern Plain and the Peninsular Plateau?*

*In 2001 the population density of Jammu & Kashmir was 99 people per square kilometre. For Rajasthan it was 165 people/km<sup>2</sup>. Add these states to the graph and think of some reasons why these population densities are different from those of the other states shown here.*

Population Density of Various States in India (2001)



## How did the population density increase in a village of UP?

To understand why there is dense population in the Northern Plain, let's take a look again at Mirpur village. Mirpur is a very old village and its changing nature can be seen with the help of the figures given below.

**Population and Land Use in Mirpur, UP**

Year	Population	Agricultural land (hectares)	Total land (hectares)	Irrigated land (hectares)	Percent of land irrigated
1861	451	228	276	59	21%
1921	731	260	276	131	47%
1961	1227	260	276	192	70%
1981	1848	260	276	250	91%

*Answer the following questions about Mirpur.*

*Did the amount of land in Mirpur that was used for farming increase, decrease or remain the same since 1861?*

*Did the total land that belonged to the village change in this period?*

*Did the amount of land that was being irrigated change over these years?*

*Make a graph to show how the amount of land under irrigation changed.*

*Did irrigation increase more rapidly between 1861 and 1921 or between 1921 and 1981?*

By 1861, most of Mirpur was already being cultivated. Virtually all of the original forest had been cut by 1921. Since then the amount of agricultural land has not increased.

You must have already read about how agriculture spread throughout most parts of the Northern Plain several centuries ago. With irrigation, 2 or 3 crops a year like wheat, sugarcane, gram, arhar etc. can be taken and the production also increases.

*Why is cultivation easy in the Northern Plain, compared to other parts of the country? Give five reasons.*

*The production of crops in Mirpur had been increased in two ways. Can you identify these from the left table. What is the difference between them?*

*Do you think number of people living in an area is somehow connected to production of crops in that area?*

## Migration and Industry in the Northern Plain

A large number of people from this area have been going out in search of employment. You read about the workers in the Parasia mines. They also came from the Northern Plain. Many of the people settled in Madhya Pradesh were originally from the Northern Plain. Large numbers of people migrate to urban centres such as Mumbai, Kolkata and Delhi as well as to the fields of Punjab.

*What problems did the mine workers face in Uttar Pradesh because of which they came and settled in Parasia?*

The Northern Plain has many industrial areas, such as Kanpur and Kolkata. During British rule Kolkata became a major city and a busy harbour. It has been a convenient place to set up factories.

In the densely populated Northern Plain there are many small and medium sized towns. Hence, there are a lot of people to buy the kinds of things made by industries.

Since transport is widely available, there is little difficulty in carrying raw materials to the factories. Steel and many minerals are brought from the Peninsular Plateau. Many kinds of agricultural raw materials, such as sugarcane, cotton and jute are produced on the Northern Plain itself.

*Look at the map showing where minerals are found in India. Where are more minerals found - in the Northern Plain or in the Deccan Plateau?*

*Fill in the blanks in the following table to show which raw materials are needed by the given industries to produce which products. Also write the main places where these things are found and produced. Get help from your Atlas.*

*Add more industries to the Table if you can.*

## Some Important Industries of India

Raw materials	Sources of raw materials	Industry	Location of industry	Products
Sand	U.P.	Glass Industry	Ghaziabad, U.P.	glass
Bauxite		Aluminium Industry		utensils
	U.P. and neighbouring states	Leather Industry	Kanpur	
Steel, Plastics, Electrical components	Peninsular Plateau etc.	Electrical Goods Industry	Punjab	
		Cotton Mills	U.P.	cotton yarn and cloth
Steel (from coal, iron ore)	Peninsular Plateau	Cycle making Industry	Haryana and Punjab	
	W. Bengal	Rubber Industry	W. Bengal	tyres
		Sugar Mills	U.P. and Punjab	sugar
		Lumber Mills	Haryana and Punjab	plywood
		Paper Mills	Guwahati and Assam	paper
	Haryana	Food Processing	Haryana	jam

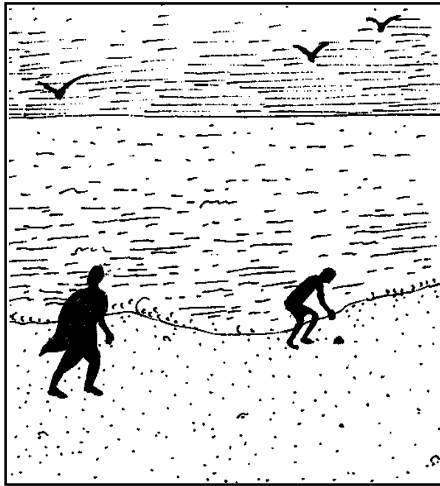


Jute, which is used to make rope, sacks and cloth

# Exercises

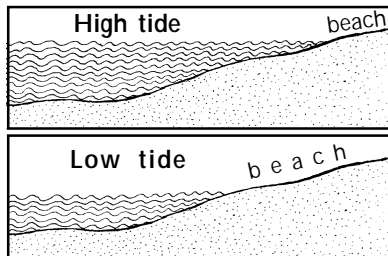
1. Refer to maps and state whether each of the following is true or false:
  - a) The Indo-Gangetic Plain is entirely in India.
  - b) The Indus River flows through three different countries.
  - c) The Yamuna does not get water from the Malwa Plateau.
  - d) Allahabad is at the confluence of the Ganga and the Yamuna.
  - e) The sources of the Indus and the Brahmaputra are very close to each other.
  - f) Even though it is farther north, the far western part of the Northern Plain gets hotter than the far eastern part.
  - g) The western part of the Gangetic Plain gets more rainfall than the eastern part.
  - h) The Brahmaputra River Plain is wider than the Ganga River Plain.
  - i) Black soil, which is good for growing cotton is common in the Northern Plain.
  - j) The total population of a district is the same as the population density of that district.
  - k) Fewer minerals are mined in the Northern Plain than on the Peninsular Plateau.
  - l) Sugarcane is grown mainly in the wetter eastern part of the Gangetic Plain.
  - m) The population is generally more in those parts of the Gangetic Plain that have high rainfall.
  - n) If District A has more population than District B, then District A must have higher population density than District B.
2. Why is irrigation necessary in the plains of Punjab and Haryana? How has irrigation benefited the people there?
3. Why is it easy to make canals in the Indus Plain and the western regions of Uttar Pradesh?
4. What are the main differences between the Indus Plain and the Brahmaputra Plain?
5. In what way is the western part of the Ganga Plain different from the eastern part?
6. Look at the map showing irrigation facilities and compare the Northern Plain with the Deccan Plateau.
7. Look at the map showing forests in India and find out whether the Deccan Plateau or the Northern Plain has more forested land. Give reasons for the difference.
8. Why is the population density greater on the Northern Plain than on the Deccan Plateau?
9. Can you tell which of two areas is more densely populated merely by looking at a table that shows the populations of the two areas? Explain.
10. Refer to the map on page 174. Can you guess which of the four districts is the least crowded and which is the most crowded? To check your answer calculate the population densities of the four districts.

# The Coastal Plains and Islands

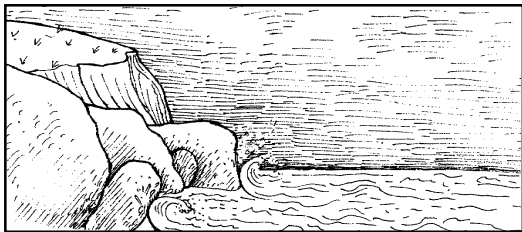


## The seacoast at one place

The coast is where the sea and the land meet. Look at this picture and see how a stretch of sandy beach extends down to meet the sea, which seems to go out to infinity! All day long, throughout the year, the waves lap the shore.



During high tide the sea comes up higher and during low tide it recedes lower, exposing more of the beach.



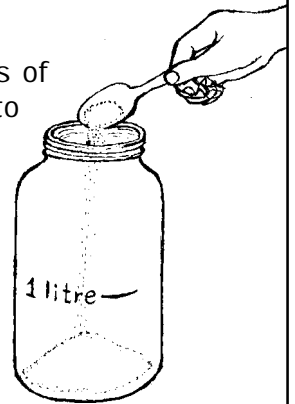
## The seacoast at another place

At some places on the coast there are cliffs and rocks. The boom and thunder of the waves lashing against the rocks fills the air all day long.

## Seawater

Can people drink seawater? Seawater contains many different kinds of salts. These salts come from the soil and rocks on land. They get dissolved in water and keep washing into rivers and into the sea. Although river water (fresh water) does not contain much salt, it all adds up. The salts do not evaporate - they get accumulated in the seas over millions of years, making seawater very salty.

Measure 350 grams of ordinary table salt into a container that will hold 1 litre (the 1 litre level should be marked on the container). While stirring, gradually add fresh, clean, drinking water until the salt is completely dissolved, making sure the final volume comes to one litre.



If you have never seen seawater, you can get some idea of how salty it is by tasting the water in the bottle. Real seawater will taste different because it contains a number of different kinds of salt, but it will taste about as salty as this.

*Could you drink the saltwater you made? Could you use it to make dal?*

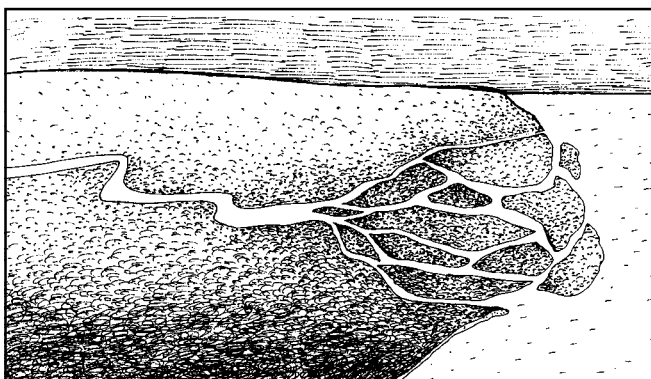
*What would happen if you try to boil an egg in saltwater?*

*Can you use saltwater to water plants?*

*Design an experiment to find out if saltwater can be used for watering of plants.*

# Where rivers meet the sea

What happens at the mouth of rivers? Does the freshwater and saltwater mix? What happens to the sediment the river carries? Let's find out.



## A delta

In some rivers, the sediment that has been carried along by them gets deposited at their mouths. The ocean currents do not carry all the sediment away - it piles up, and the area around the mouth gets shallow. The river keeps getting choked by sediment, so it makes new branches or **distributaries**. After many thousands of years, the sediment forms new land and islands that extend out into the sea. This area is called a **delta**. Due to the sedimentation and weak tidal currents, seawater does not usually come far up the rivers in deltas.



## A river estuary

In some other cases a river meets the sea at a place where the tides are so strong that they create currents that carry most of the sediment away. No delta is formed. Seawater floods into the mouth of the river, making it broader and carrying away the sediment. The mouth of this kind of river is unusually wide. This is formed due to erosion and sinking of coastal areas. Such open mouths of rivers, where there is a mixture of fresh water and salt water are called estuaries.

## Map-study

*You can find out a lot about coastal plains by studying some maps of India.*

*Do you live on the coast or have you ever been to the coast? Look at a map of India and find the names of some places located on the coast.*

*How many states of India are located along the coasts? Make a list.*

*Estimate the lengths of the coastlines on the eastern and western sides of India. Which looks longer?*

*The areas near the coasts of India are mainly low-lying plains, called the coastal plains. Which coastal plains are wider - the eastern or the western?*

*Do the Indian rivers that flow into the Arabian Sea have deltas? Locate four major rivers of the west coast. Which states are they in?*

*Notice in the Atlas that in fact there are many small rivers coming into the Arabian Sea, and their names are not mentioned. These rivers are hardly 60 to 120 kilometres long. They come down the steep slopes of the western ghats and flow over the western coastal plains before they meet the sea.*

*Estimate the width of the coastal plains at the narrowest and widest places.*

*On the eastern coast of India you will find many deltas. Which rivers have deltas? Where do these rivers begin? Are they long or short rivers? Why do they not flow west into the Arabian Sea?*

*How vast are the oceans that lap the shores! Which countries besides India lie on the shores of the Bay of Bengal and the Indian Ocean?*



*There are many large and small islands in these oceans. Some are so small that they are not even shown on the maps in your Atlas. Some of these islands belong to India. The main ones are the Andaman and Nicobar cluster and the Lakshadweep, Amindivi and Minicoy cluster of islands. Locate them on the map.*

*Which of these island clusters are closer to the mainland of India? Use the scale on the map to estimate the distances from some mainland ports to these islands.*

*What other islands are there in the Indian Ocean?*

## Harbours

Indian and foreign ships come to harbours to load and unload the cargo they transport. The sea near a harbour has to be deep enough so that large ships do not run aground. These should also be protected from storm. Railway lines have been laid so that trains can carry the goods to and from the harbour. Thousands of labourers work here loading and unloading ships.

*Look at a map showing rail and sea routes of India in an atlas. Study how Mumbai, Chennai and Calcutta are connected to the world by ocean routes and to other parts of India by railroads. Organise the information you get in a table.*

While there are such big cities on the coasts with many kinds of industrial and business activities, most people in the villages on the coastal plains live by farming, fishing and some small-scale industries.

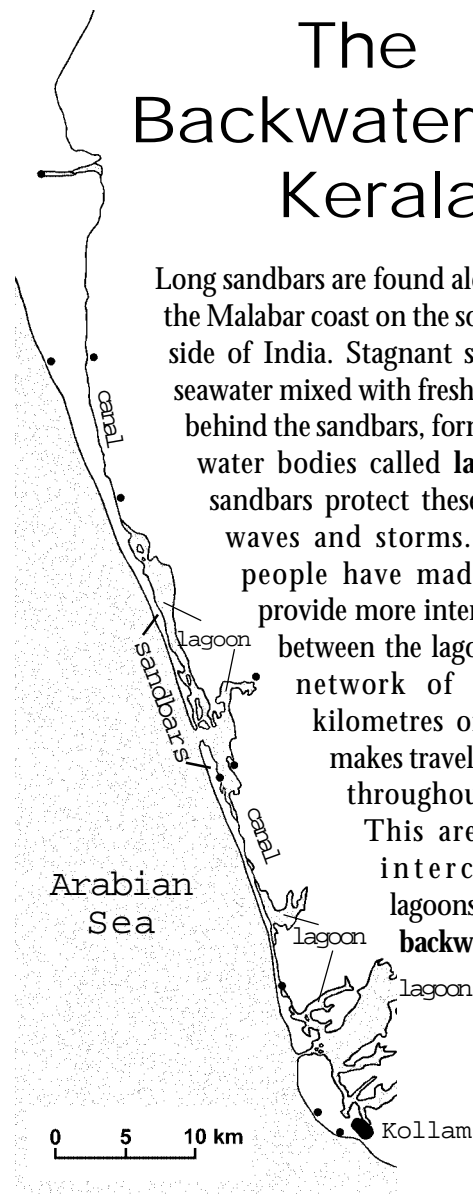
Boats at a dock in Mumbai harbour



## The Backwaters of Kerala

Long sandbars are found along much of the Malabar coast on the south-western side of India. Stagnant seawater and seawater mixed with freshwater collect behind the sandbars, forming shallow water bodies called **lagoons**. The sandbars protect these areas from waves and storms. In Kerala, people have made canals to provide more interconnections between the lagoons. Thus a network of about 500 kilometres of waterways makes travel by boat easy throughout this area.

This area, with its interconnected lagoons, is called the **backwaters**.



# Agriculture in the Coastal Plains

*Find out the main grain crop grown in the coastal plains (you can find out by looking in your Atlas). Is it the same in the eastern as well as the western coastal plains?*

*What are the coarse grains that are grown in the coastal plains?*

*What other commercial crops are grown in the coastal plains?*

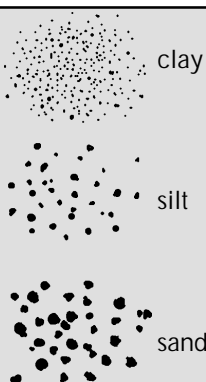
## Agriculture in the Deltas of the Eastern Coastal Plains

From May to August it rains heavily along the western coast and in the Western Ghats. Although it does not rain as much along the Eastern Coast, people take advantage of the rivers that flow there. These rivers have their source in the Western Ghats. Thus the rivers help to bring water from areas of heavy rainfall in the west to areas of low rainfall in the east.

As they flow along, rivers also wear away the soil and rocks they pass over. Soil and rocks are carried off by the rushing water.

*You know that soils have particles of different sizes called clay, silt and sand. Identify them in this picture.*

*Which are carried farther by rivers: larger rocks, small pebbles, sand, silt or particles of clay?*



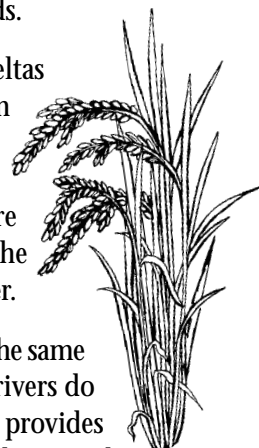
When they flood, rivers deposit soil containing large quantities of clay and silt in the deltas. This soil is also rich in humus.

For centuries people have made canals in deltas to carry floodwaters to the fields in order to increase the moisture content and fertility of the soil. Because of this, it has been possible to produce plentiful crops in deltas.

However, floods also have harmful effects that have to be guarded against. For example, floodwaters can drown people, destroy houses and villages,

submerge crops and cover fertile fields with layers of sand. Therefore, the farmers also build high bunds along the riverbanks to control the floodwaters. They can then use their canals to let in water according to their needs.

The rivers begin to flood the deltas of the eastern coastal plains from the month of May, and that's when the agricultural work starts. In May the rice fields are prepared and sowing is done. The paddy is harvested in September.



A second paddy crop is sown in the same fields in October. But now the rivers do not flood. The rain in October provides water for this crop. This crop is harvested in January, when moong is sown in the same fields. The moong is harvested in April. In this way, agricultural work continues here almost throughout the year.



Apart from paddy, there are plantations of bananas, paan and betel nut in many places in the deltas. These crops also require a great deal of water.

*You had found some other crops of the eastern coastal plains from the maps. In which parts of the plains would they be grown? In the deltas or elsewhere?*

*Since two to three crops are cultivated in a year in the deltas, you might think that a large number of people would settle here. Look at the population map of India to see if the delta regions are very densely populated.*

## Drier Regions between Deltas

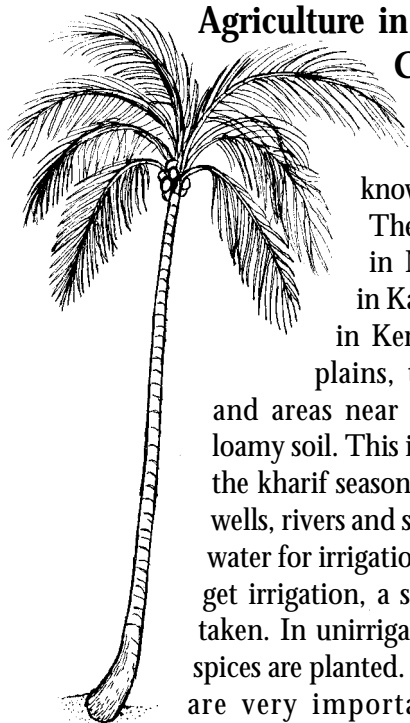
If you look on a map of the eastern coastal plain you will find that there are regions between the deltas that do not have any large rivers - between the Mahanadi and Godavari, between the Krishna and Cauvery, and the region south of the Cauvery. The monsoon rainwater that the major rivers carry from the Western Ghats does not reach these parts. So this region doesn't get the humus and silt carried by these rivers. Compared to the deltas, these regions are dry. People living here have to make do with the little rain that falls here. This rainfall is enough for cultivating one or sometimes two crops a year.

The people living here collect rainwater in tanks. This keeps the soil moist and the water can also be used for irrigation, to some extent. The water in the tanks is not enough to irrigate the entire region, so only some parts are irrigated. Several crops that require less water are grown here. These include cotton, tobacco, groundnut, sesamum, chilly and pulses. Jowar and ragi are also grown in those regions where irrigation is not possible.



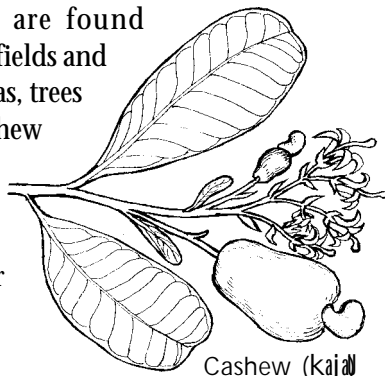
Cotton grows in the drier regions between deltas

## Agriculture in the Western Coastal Plains



coconut

The different regions of these plains are known by different names. They are called Konkan in Maharashtra, Kanara in Karnataka and Malabar in Kerala. In these narrow plains, the flat river valleys and areas near estuaries have good loamy soil. This is used to grow rice in the kharif season. After the monsoon, wells, rivers and streams are used to lift water for irrigation. In those fields that get irrigation, a second crop of rice is taken. In unirrigated fields, pulses and spices are planted. Tree plantation crops are very important here. Coconut plantations are found along paddy fields and in sandy areas, whereas, trees such as those of cashew nut, mango, chikoo, and arecanut are grown on the coarse, less fertile soil near the hilly regions.



Cashew (Kajal)

## The Gujarat Coastal Plains

The coast of Gujarat gets much less rainfall than the coastal plains in the rest of India. Agriculture here is thus very different. Crops that require a lot of water are grown only in a few irrigated parts of the Gujarat coastal plain.

*Compare the Gujarat and southern coastal plains on a physical map of India to think of a reason why Gujarat gets less rainfall. Explain, including reference to how clouds and rain are formed.*

*Which of the following crops would you expect to find in the coastal plains of Gujarat? Make your estimation and then check in the Atlas to see if you are correct.*

*paddy wheat coconut cashew bajra tea  
cotton jowar tobacco rubber sugarcane*

*Gujarat has two large peninsulas. What are their names? Sketch them in your notebook.*

**The Rann of Kutch** is a saltwater marsh – it is mostly muddy or covered by water during high tides and after the rains. Not much grows here except a few kinds of grasses and bushes. It is a vast, wild land without towns, villages or roads.

# The Impact of Dams on Deltas

You know about dams built on rivers to irrigate dry regions of the plateau. These dams have caused problems for people living in the deltas. Because of the dams, less water and silt is reaching the deltas, so the fertility of the soil there is gradually decreasing. Thus sharing of river water between different regions is becoming an issue of conflict. For example you may have heard about the Cauvery water dispute between Karnataka and Tamil Nadu.

The water stored in Krishnarajasagara is used for irrigating a number of nearby districts and for meeting the needs of Bangalore. The water stored in Mettur dam is released for irrigating the crops grown in the delta regions of Tamil Nadu.

*What has been reported in the press about this dispute? Share what you remember and try and collect some reports.*

*Study a map to see how the Cauvery flows between these two states.*

*Which state is upstream on the river and which state is downstream?*

*Locate Krishnarajasagara dam in Karnataka and the Mettur dam in Tamil Nadu. How would the waters of the Cauvery River fill the reservoir of the Mettur dam?*

*Supposing there is poor monsoons in a year (as it was for e.g. in the year 2002), what are the steps that Karnataka can take to meet the water needs of its people?*

*What are the steps that Tamil Nadu can take to meet the water needs of its people?*

*People have been feeling the need for a national water policy so that such conflicts can be resolved in a fair manner. What do you think should be the basis of resolving such conflicts? Have a discussion in your class.*

Let's learn something about how the people live in villages by the sea and what changes have occurred recently in their lives. We'll find out about a hamlet of fisher folk on the eastern coast of India where a man named Thomas lives.

## Going Out Fishing at Sea

### The Fishermen Head for the Sea

It is three in the morning. Thomas's wife wakes him up and gives him some rice gruel to eat. By 4:00 am, Thomas is ready to go out to sea. His friend David waits for him on the beach. Both are poor fishermen. They do not own any boats or nets. They work on Rajan's boat, a kattumaram. Rajan is also not very rich but he does own a kattumaram that cost Rs 10,000 and fishing nets that are worth Rs 5,000. It is on this kattumaram that Rajan and his son go to sea to catch fish. Thomas and David have been hired to help them.





Pushing the kattumarams out into the waves

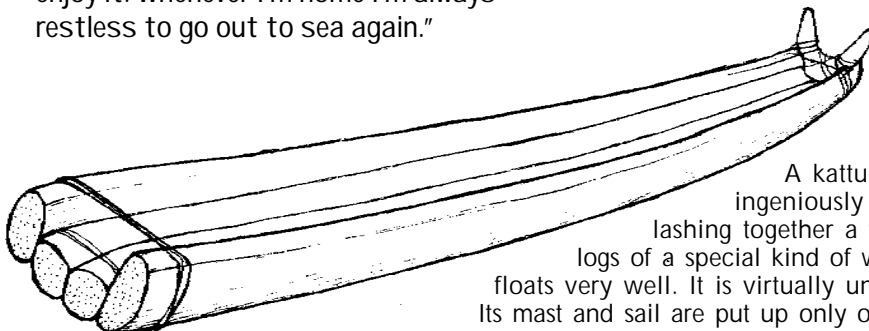
It's still quite dark outside. At night, a breeze blows from the land to the sea. This breeze will help them sail out. The sail and the nets are lashed tightly to the kattumaram so that the waves cannot wash them away. Many people come to push the kattumaram out to sea.

After a while, Thomas and David set down their paddles, hoist the mast, and unfurl the sail. The kattumaram dances along on the waves. The waves are not so high today, but at times they can get so big and powerful that they can overturn the kattumaram, knocking everyone into the sea. If that happens, the fishermen turn it upright, climb back on board, and carry on with their work.

Thomas was seven years old when he first went to sea. Twenty years have passed since that day. If you ask him how he likes his work he will reply, "Oh, I enjoy it. Whenever I'm home I'm always restless to go out to sea again."



The sail has been set



A kattumaram is ingeniously made by lashing together a few large logs of a special kind of wood that floats very well. It is virtually unsinkable. Its mast and sail are put up only out at sea.

*What difference do you see between the boats in your area and the kattumarams in these pictures?*





By the late morning, the sun has warmed up the land and also the air above the land. This warm air rises up and cooler air from above the sea rushes in to take its place. Thus the breeze has changed direction and is now blowing from the sea towards the land. The fishermen use this breeze to return to shore.

It's hard work to pull in the net full of fish

But it is no easy task to sail the kattumaram. It is hard work: rowing, adjusting the direction of the sail according to the breeze, and drawing in the heavy nets. Catching fish at sea is also dangerous. There is always the fear of drowning. When a fisherman goes out to the sea it is not certain that he will return. He can be caught in a sudden storm, or his boat might strike a rock and be dashed to pieces. Or he might even fall prey to sharks.

Two or three kilometres away from the coast, the fishermen drop anchor. The heavy anchor sinks into the sand at the bottom of the sea and keeps the boat from drifting away. Thomas helps open the nets and spread them in the water. An hour or so later they pull up the heavy nets full of fish and begin the journey back to the coast.

By the time they get home it is around noon or a little later. Other boats are also coming in. On shore a crowd of traders and other people are waiting for the boats.

## The Fish is Sold to Traders

Thomas's mother is one of the people there with her basket. As soon as the fish are unloaded from each kattumaram, the women make a dash towards the heap of fish. The auctioneer appears. Usually, the catch is sold on the beach by an auctioneer. In return, he gets a portion of the catch. Small traders, like Thomas's mother buy the fish and take it to the market to sell. She also takes some to cook for the family.





This time, a big trader makes a grab for Rajan's catch. Rajan has borrowed money from him for his sister's wedding. The trader had lent the money on the condition that Rajan would sell his fish only to him, and at a cheap rate. This does mean that Rajan and his friends lose some money, but if they sell the fish to anyone else, the trader won't lend them money in future. He may even ask Rajan to return the entire loan immediately. So Rajan's fish is sold off to this trader.

The big trader preserves the fish in ice and sells it in faraway cities. Sometimes it is exported to foreign countries, which earns a lot of money.

Rajan divides the money he receives from the trader into five parts - one part each for Thomas, David, and his son, and two parts for himself. Rajan gets one part for his labour and another for his kattumaram and nets.



Drying fish is one way of preserving it for future use

## Months without Money

During the months of January and February the catch is poor. The fishermen can never be certain whether they will get any fish, even after a day's hard work. This situation continues till April. During these months, labourers like Thomas and small fishermen like Rajan undergo many hardships. They borrow money from traders to keep their households going. From May or June until September, the catch is good. They try to repay their debts during this period.

***How is the fishermen's catch sold?***

***Why was Rajan not able to sell his fish in the auction?***

***Of the money obtained by selling the fish, why did Rajan keep two parts for himself while he gave everyone else only one part each?***

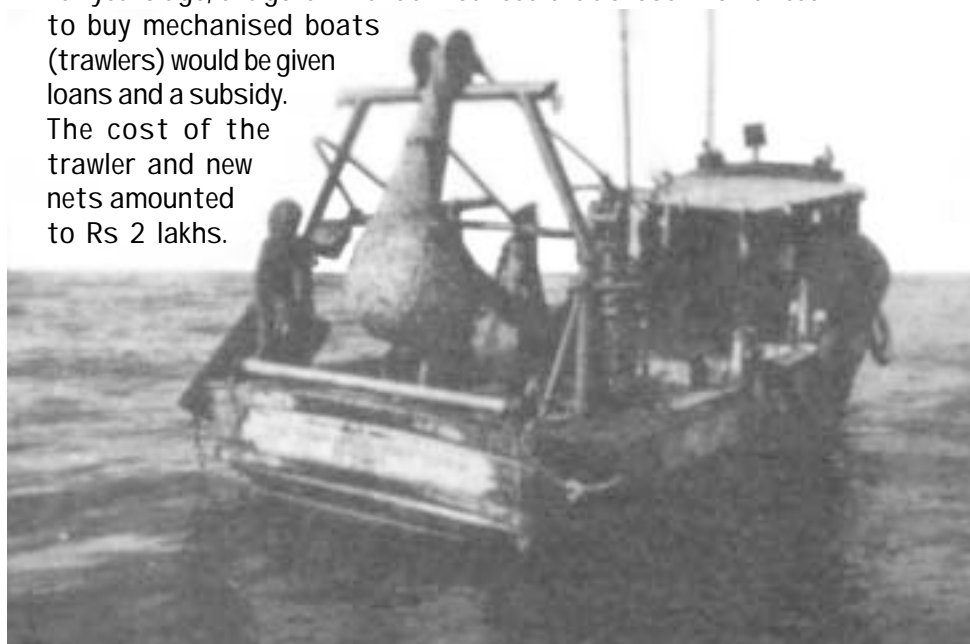
## Big Fishermen, Small Fishermen

Among farmers there are small, medium and big farmers and labourers. The same holds true for fishermen. Workers like Thomas do not own a kattumaram or nets. They work on the boats of others. More than half of India's fishermen work as labourers for others. It requires around Rs20,000 to Rs50,000 to purchase a boat, kattumaram and nets. That is a sum that only a few people can arrange. Big fishermen own many boats, kattumarams and large nets. To operate these and pull in the nets they employ 50 to 60 labourers. They keep half of the catch and the rest is divided among the workers.

One such big fisherman is Anthony. He used to have many kattumarams, boats and different kinds of nets. About 50 to 60 labourers worked on his boats. Most of these workers took loans from him, so they worked for him for lower wages. Anthony accumulated a lot of money over the years and became rich.

## Mechanised Boats (Trawlers)

Ten years ago, the government announced that those who wanted to buy mechanised boats (trawlers) would be given loans and a subsidy. The cost of the trawler and new nets amounted to Rs 2 lakhs.



Anthony spent Rs 1 lakh of his own and took a loan of Rs 1 lakh to buy a trawler. Apart from Anthony, there were only two other persons in the village who could arrange the money to buy these new boats.

Using the trawler has proved to be very profitable for Anthony. Now he needs very few workers - only 6 or 7, against the 50 or 60 workers he needed earlier.

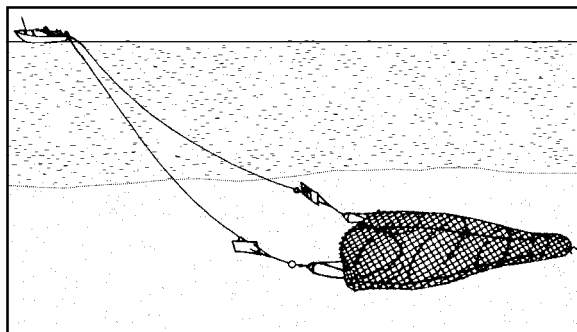
He has made his nephew the captain of the trawler and most of the workers are his relatives. With a trawler they can go farther out into the sea in case the catch near the coast is low. A trawler can go out to sea even if the wind is strong and the waves are high. As a result the catch is bigger.

Anthony has earned very high profits with his trawler. He has sold off his sailboats and kattumarams and bought two more trawlers. This meant that a large number of workers lost their jobs.

***Why do labourers working for big fishermen like Anthony work at low wages?***

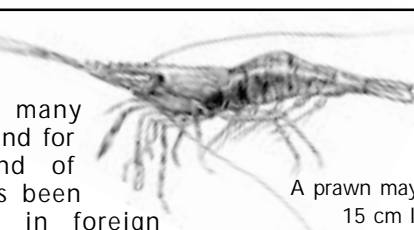
***What are the advantages that a trawler provides to its owner?***

In the beginning, Anthony used to take his trawler 10-12 km out into the sea to catch fish. But when the demand for prawns rose, the situation changed. Prawns are found just 3-4 km from the shore, and not farther out in the sea. So Anthony ordered his ships to drop their nets only 2 to 4 km from the shore. Along with the prawns they would also catch other kinds of fish in their nets. Not just big fishermen, but big traders and industrialists also got into the prawn business with their trawlers. Thus a lot of trawling took place near the shore.



## Prawns

Over the past many years, the demand for prawns (a kind of crustacean) has been steadily rising in foreign countries - and so have their prices. The prawns that fishermen catch are bought off by big traders so that they may be supplied to packaging factories. In the factories the prawns are cleaned and boiled in water with salt. They are then frozen in refrigerated rooms. The frozen prawns are exported to foreign countries where they fetch a very good price. The ships on which the prawns are sent have refrigerated holds in which the prawns are kept frozen for the weeks it may take to reach their destination.



A prawn may be 15 cm long

## How Trawlers affect the Small Fishermen

Two to four kilometres from shore is the zone where small fishermen usually spread their nets. As more and more trawlers come into use, the catch of the small fishermen is growing smaller and smaller. Now they often return empty handed from the sea. Consequently, they have to frequently borrow money to run their households. In this way they are coming more and more into the grip of traders and money lenders.

***Why do the owners of trawlers want to catch prawns?***

***Why do small fishermen have to borrow more money due to the coming of trawlers?***

In the evening, all the fishermen and labourers meet to discuss their problems. Rajan says, "From the time these trawlers have started running, the number of fish in the sea has decreased. Has anyone ever before heard of a shortage of fish in the sea? These big boats catch all the fish, and there is nothing left for us!"

"Once when I was working on Anthony's boat, I saw for myself the horrible way the trawlers work," Thomas says. "There are wooden planks attached to the lower part of the net, and as the trawler moves, these planks go scraping along the sea floor."

A trawler net scrapes the bottom of the sea to catch fish

On hearing this many fishermen exclaim, "What!, it is only on the sea floor that the fish deposit their eggs! It is only there that young fishes grow. What must be happening to them?"

"What do you think?" says Thomas, "They all get killed! That's another reason why there are less fish in the sea."

"Another thing," adds David. "These trawler nets are so fine that even small fishes get caught in them. Though, they are of no use to any one! They get killed for no reason at all! No wonder we don't catch big fish these days – the little ones get no chance to grow up."

Just then another fisherman comes along, crying out loudly, "Tell me, who will teach these men a lesson! They have ruined me! I had spread my net on the sea. This boat of Anthony's went right through it, tearing it apart. Thousands of rupees it had cost - and now, all is lost."

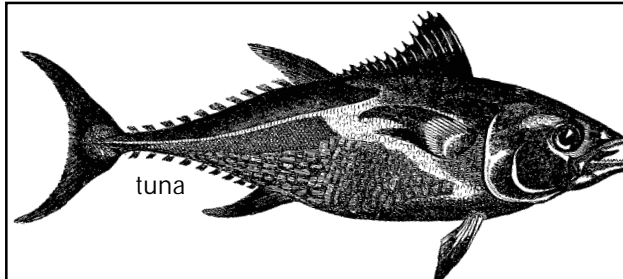
"Last week they destroyed my father's net just like that," another man says. "Every day they are becoming more and more bold - only two days ago one trawler came speeding along and hit my friend's boat and overturned it. Poor fellow, he almost died!"

"We must get together and do something to stop all this. If we don't stop them we'll all be ruined - and even before that our sea will be ruined," says Thomas.

State governments have tried to regulate the activities of trawlers by not allowing them to fish near the coast and use small nets. Governments are also trying to help fishermen to motorise their kattumarams.

*When mechanised boats began to be used for catching fish it seemed that the production of fish would increase, and the condition of fisher folk would improve. But what happened in reality? Narrate briefly.*

*Write an imaginary conversation between Anthony and Rajan on the topic of the size of catches.*

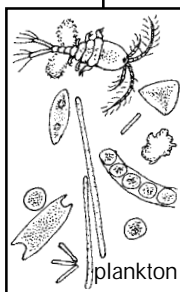


## Why are there Less Fish in the Sea these Days?

**1. Overfishing:** The main reason for the decrease in the population of fish and other marine life is overfishing and the use of trawlers.

**2. Pollution kills marine life:** There are many big factories along rivers and in the coastal regions. They use many kinds of poisonous chemicals, which are then released into the rivers and seas. Certain chemicals, such as ones containing toxic metals like mercury, cadmium and lead, can kill fish and other marine life. Also, when people eat fish that contains too much of these toxins, they can suffer serious health problems such as permanent brain damage.

**3. Pollution causes excessive growth of algae:** Too much organic waste such as sewerage, fertilisers, pesticides and detergents washing into the rivers and seas can have another effect. It can cause too much algae to grow on the surface of the sea. This can kill coral reefs and other marine life deeper down by preventing enough sunlight and air from reaching them.



**4. Reduction in nutrients going into the sea:** Rivers carry fresh water and also humus and nutrients into the sea. Many kinds of microscopic organisms called **plankton** live on the nutrients rivers deposit in the sea. Small fish and other marine animals eat plankton. Bigger fish eat smaller fish. Birds and other animals eat fish. Thus marine life is dependent on the humus and nutrients brought into the sea by fresh river water. In the last 50 years, many dams have been built across the rivers of India. Due to these dams less fresh water now reaches the sea. Humus brought by the rivers has also decreased. Can you see how this might affect the fish in the sea?

**5. Excessive siltation reduces marine life:** Trees and plants prevent too much sediment from draining into rivers. But when land is cleared of forests, rivers sometimes carry too much silt and sediment into the sea. The sea becomes muddy and turbid, and marine life cannot get enough sunlight to survive.

*Too little nutrients in the sea can be bad. Too much nutrients can be bad. Explain.*

*Reduced river flow can result in either less fish or more fish. Explain.*

# The Islands of India

## The Andaman-Nicobar Islands

For many centuries, people have been living on the Andaman-Nicobar Islands, located far to the east of India's mainland. Trading ships on their way to Indonesia and China have also been going past these clusters of islands.

The Andaman-Nicobar Islands are heavily forested with lush evergreen tropical trees. Spices, betelnuts, coconuts and bananas grow in plenty. A fruit called pendse (kevda), jackfruits (katahal), wild pig meat and honey are favourite foods.

### Mangroves

You may have heard of mangrove trees, which grow in places near seacoasts where saltwater mixes with freshwater. They are one of the few plants that can live in salty, wet marshes.

#### How do they survive?

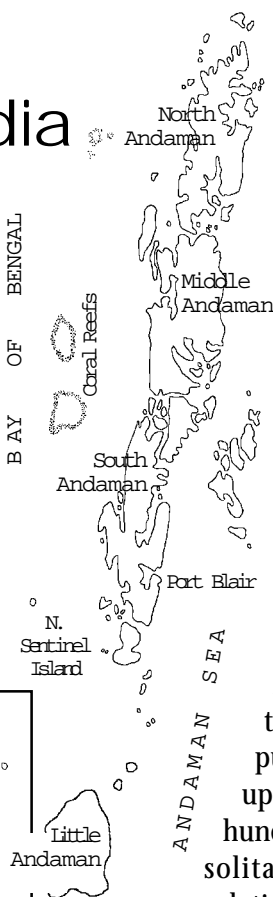
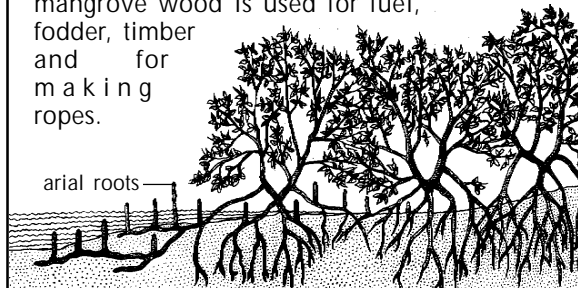
(1) They have special filters and glands to separate out the salt.

(2) They have large networks of roots that keep the plants firmly anchored in the marshy soil that keeps getting flooded with salty water when the tides rise.

(3) Parts of the roots also extend above the ground and above the water so that they can get the air that the plants need to survive.

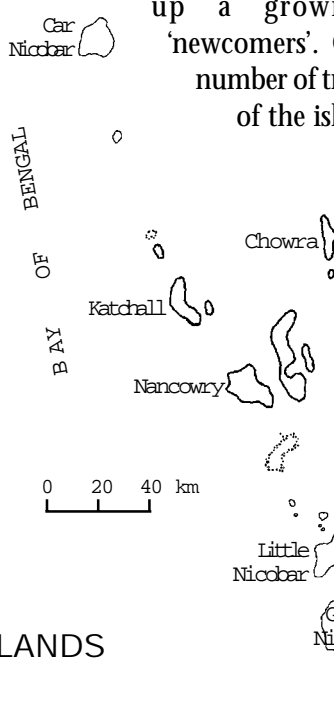
Mangroves are very important in providing a habitat for a wide variety of microscopic organisms, insects, crustaceans, fish, reptiles and birds. They also trap silt and help control floods.

However, mangrove swamps are under threat in many areas. These days they are being drained or filled and used for agriculture, industry and urban development. Also, mangrove wood is used for fuel, fodder, timber and for making ropes.

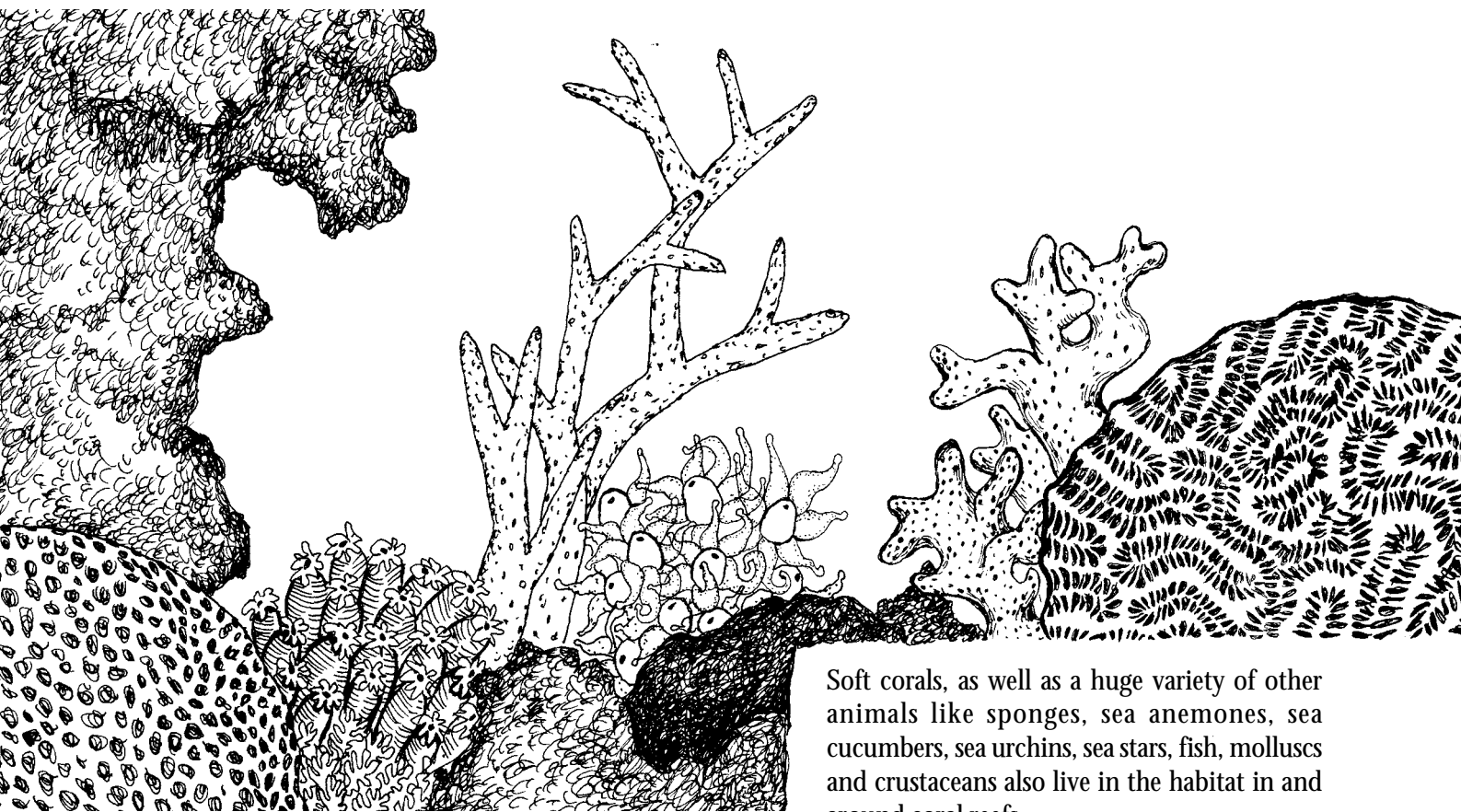


The original inhabitants of the Andamans belong to a number of tribes, and for centuries they have been living by fishing, hunting and gathering - without farming. Why haven't they taken up agriculture? Is it because they have had no need for it, with the abundance of wild produce? Or is it because the hilly, forested land is not very suitable for farming? These are interesting questions to debate.

Since 1858, the British took advantage of the isolation of the Andamans and sent prisoners from the mainland of India there for punishment. In 1905, the British set up a huge prison in Port Blair with hundreds of cells to keep prisoners in solitary confinement. Many rebels, revolutionaries and freedom fighters of India spent years of torture and misery in this cellular jail. The prisoners that survived and were freed were encouraged by the government to settle down there itself instead of returning to the mainland. Other people from the mainland of India have also come to settle in the Andamans. Over time, government officials, traders, tourists and people serving the tourists have made up a growing community of 'newcomers'. On the other hand the number of tribal inhabitants on some of the islands is decreasing.



Tourism has increased and so has trade in timber, coconut coir ropes and dried fish. These are exported from the islands whereas most vegetables and food-grains are imported. Some rice is grown for local consumption.



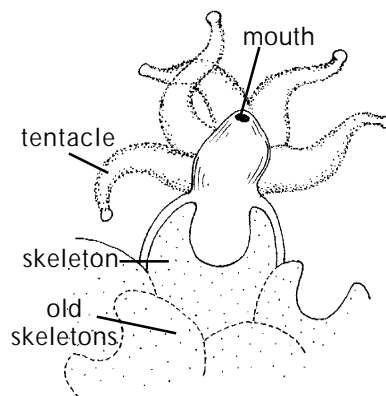
Soft corals, as well as a huge variety of other animals like sponges, sea anemones, sea cucumbers, sea urchins, sea stars, fish, molluscs and crustaceans also live in the habitat in and around coral reefs.

## Coral Reefs

Look at this picture - what do you think it shows? Plants? Rocks? Sea Weed? Actually, these are corals - which are animals!

As shown in this close-up picture, a coral consists of a small polyp and a hard outer, cup-like skeleton that remains after the polyp dies. New polyps build their skeletal cups right on top of the old cups. They remain fixed in place. Over thousands of years, many layers of the skeletons of dead corals build up to form a large rock-like, solid structure in a variety of spectacular shapes: a **coral reef**.

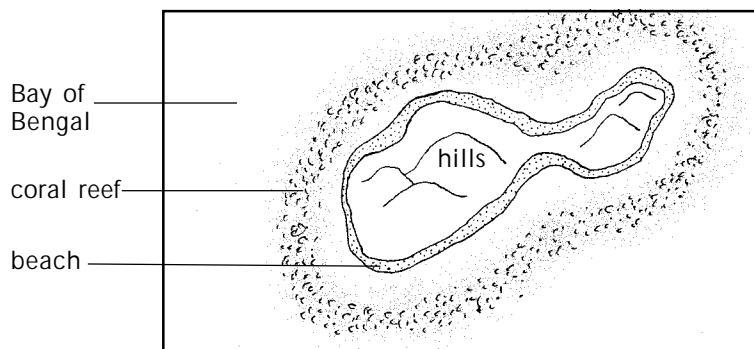
Coral polyps eat plankton (microscopic organisms) that they catch with their stinging tentacles.

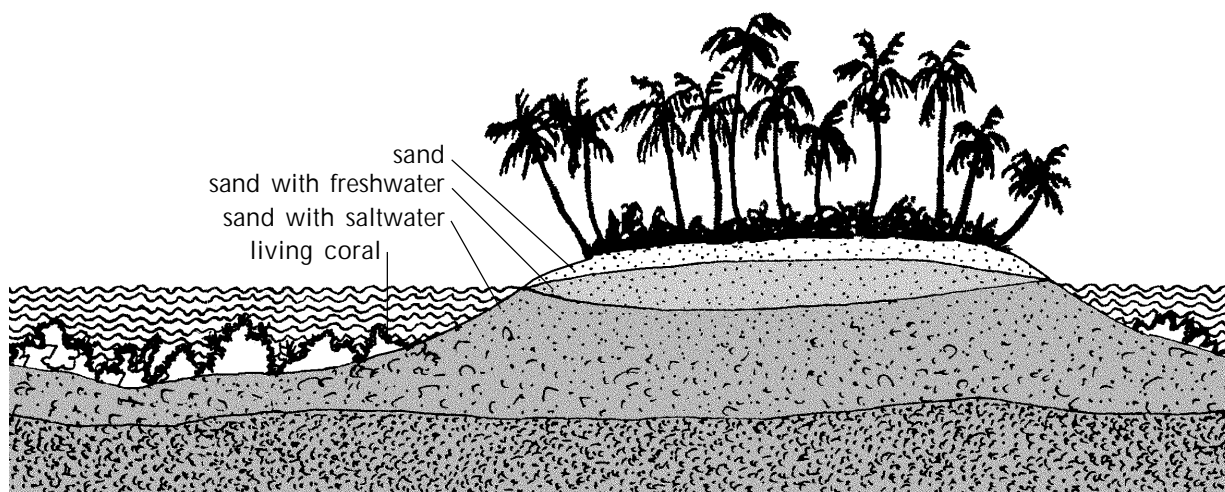


a living coral polyp

Coral reefs can survive only in salt water that is just the right, warm temperature. The water must also be shallow and clean, so that enough light can reach the algae upon which the coral depend. Without light, algae cannot live.

Coral reefs are found in fringes along the shores of the Andaman-Nicobar Islands, which are volcanic hills that stick out from the bottom of the sea.





A Coral Island

## The Lakshadweep Islands

In some places, where the sea is shallow, there are islands sticking out of the water made of the accumulated piles of dead, broken up coral rocks and coral sand.

Seeds of various plants are brought by wind, waves and birds, and may take root in the sand. Plants survive on the rainwater that collects in the sand, forming a layer above the heavier salt water further down. Coral continues to live on the reefs in the shallow seas in and around the islands. This protects the islands from waves and storms. A coral island can sometimes become a vegetated, inhabitable island.

In the Arabian Sea, the Lakshadweep, Amindivi, and Minicoy Islands (a Union Territory of India) and further south, the Republic of Maldives are such coral islands. The largest inhabited islands

are less than 4 km long, and rise not more than 2 metres above sea level.

Coral reefs can be easily killed by various human activities. This may have far-reaching detrimental effects on the marine environment.

The most common trees native to the Lakshadweep Islands are coconuts. There is not a large variety of plant or animal life above ground on the islands – the really amazing variety of life lives in the water around the coral reefs.

The Lakshadweeps are inhabited by people who's ancestors had come and settled here from the Indian mainland. Fishing, tending coconut plantations and tourism are the main occupations. Other than growing coconuts and tending small household gardens, little agriculture is practiced, due to the sandy soil.

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## Exercises

1. Look at the section about deltas and describe how deltas are formed in your own words.
2. Look at detailed maps of India and find four large rivers that do not have deltas.
3. Are there any rivers that flow from the eastern coastal plain across India to the western coastal plain? Explain why or why not.
4. Would you expect to see a lot of large rocks and boulders in deltas? Explain why or why not.



5. *Why might you expect to find good farming land in a delta?*
6. *Can good harbours easily be made on a delta? Explain why or why not.*
7. *Why is there dense population on the coastal plains?*
8. *Describe in your own words the daily routine of a small fisherman and fisherwoman.*
9. *If you were a fisherman, what fears might you have about your work?*
10. *In which months is the catch of fish good and in which months is it low?*
11. *List some advantages and disadvantages of using mechanised trawlers as compared to kattumarams for fishing.*
12. *On the right is a present-day map of the region around Cuttack. Which large river is shown here?*
13. *Which of the following maps shows how the area around Cuttack might have looked a few thousand years ago? Explain.*



14. *Suppose there are two girls whose families both farm small plots of land not far from the Krishna River: Mala, whose farm is close to Tenali, and Vani, whose farm is close to the dam at Nagarjunasagar. Find their locations on a map and explain how each of the girls might feel if a plan is announced to raise the height of the dam.*



Fisher Women - a painting by K Srinivasulu

## CHAPTER 17

# The Thar Desert



If you have water, you have everything else. And if you don't have water, what do you do?

Let's look at one of the driest parts of our country. This is the Thar Desert in western Rajasthan. Throughout the whole year it gets very little rainfall.

*Find the Thar Desert (shaded grey) in this map.*

*In which countries and states is the Thar Desert located?*

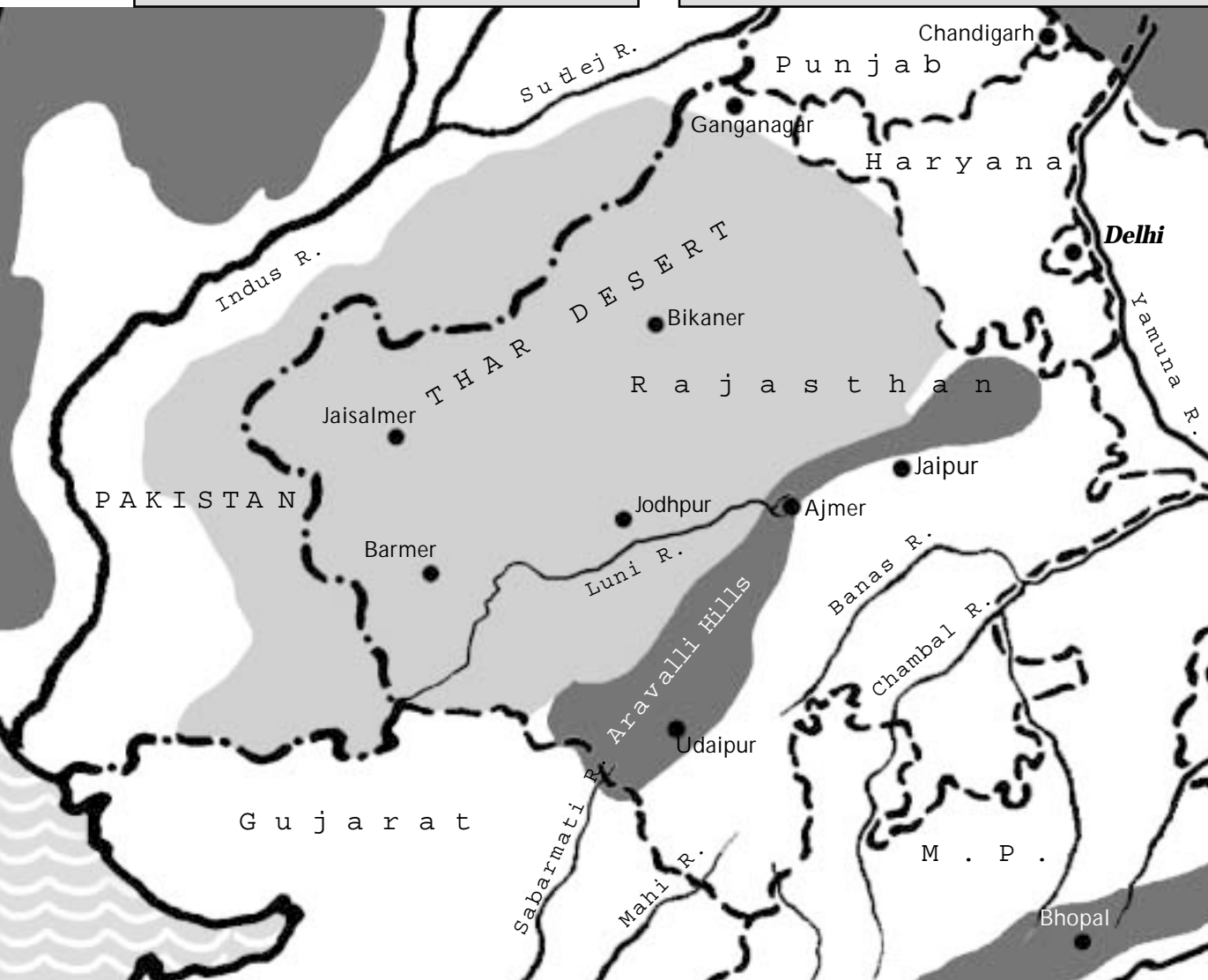
*From which hills does the Luni River begin?*

The Luni is the only big river to flow in the western part of Rajasthan. And even in the Luni, water does not flow throughout the year. However, in the large region northwest of the Luni there is not a single river to be seen.

*If an area has no rivers, what does this imply? Why doesn't it have rivers? What kind of place must it be?*

*Is the capital of Rajasthan located in the Thar Desert?*

*In the part of Rajasthan to the east of the Aravalli Hills, there are many small rivers. What are their names?*



# Rainfall and Temperature

Look at the map showing annual rainfall in India. You will find that as you go from the east to the west in Rajasthan, the rainfall decreases. This is also shown in the two rainfall graphs here.

*Look at the annual rainfall map and tell how much it rains in each of the following areas:*

*The area to the east of the Aravalli hills*

*The Aravalli Hills and the area to their west*

*The extreme west of Rajasthan*

*For comparison, tell how much it rains where you live.*

*Using the graphs on the right, estimate how much is the annual rainfall in Jaipur and Jaisalmer and see if this agrees with what is given on the annual rainfall map.*

*When is the monsoon in Jaipur and Jaisalmer?*

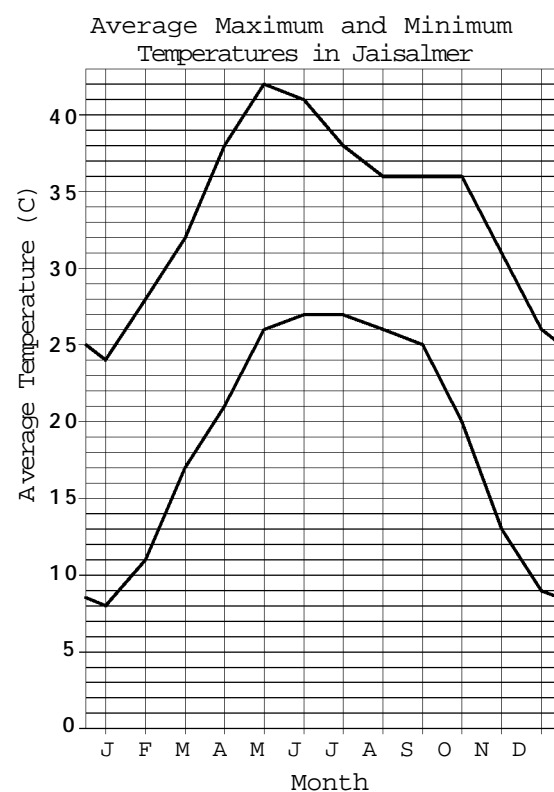
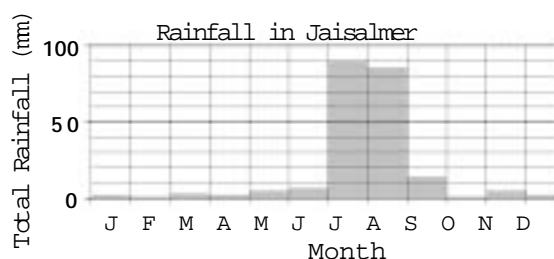
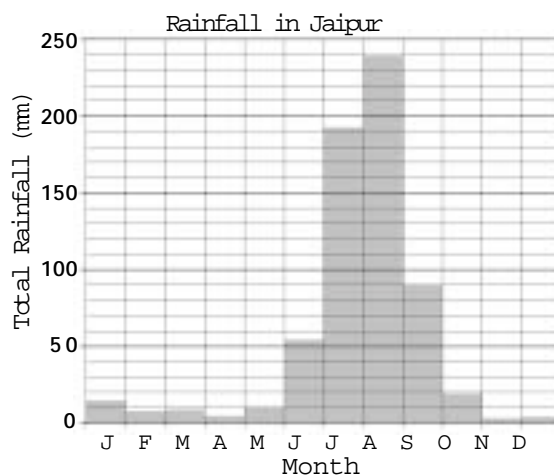
Not only does it rain very little in the Thar Desert, but it also happens that sometimes many years pass without a single drop of rain. After many years, it may suddenly rain very heavily, leading to flash floods in dry rivers and nallahs. But this water dries up before long. There is never enough water to enable rivers and nallahs to flow for a long distance.

*Look at the graph on the right. Which are the hottest and coldest months in Jaisalmer and how hot and cold do they usually get?*

*Are the hottest and rainiest periods in Jaisalmer at the same time of the year?*

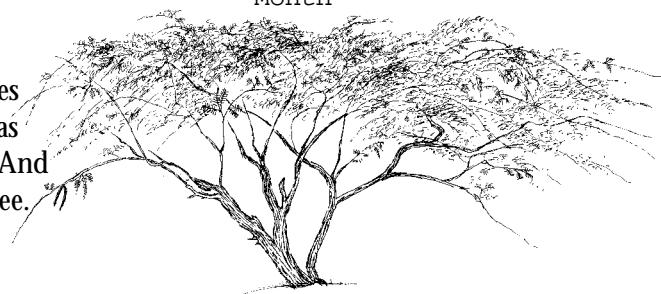
*Does it get much cooler during the monsoon than during the summer in Jaisalmer?*

*Why is it usually cooler in August than in May?*



## Vegetation

Because of the absence of water, one can go for many kilometres without seeing a single tree in the desert. But in most areas there are many kinds of small thorny bushes and grasses. And here and there you might be able to spot a khejdi (Kajal) tree.



# Living in the Desert

Come, let's find out how people live in such a dry place.

In many Indian languages, the word for desert is marusthal – literally meaning, a place of death. This is because the lack of water can kill people, animals and plants. During times of severe drought, people and animals may have to face death if they do not migrate.

*Look at a map to find out whether the population is denser in the eastern or western part of Rajasthan. Explain why the density differs.*

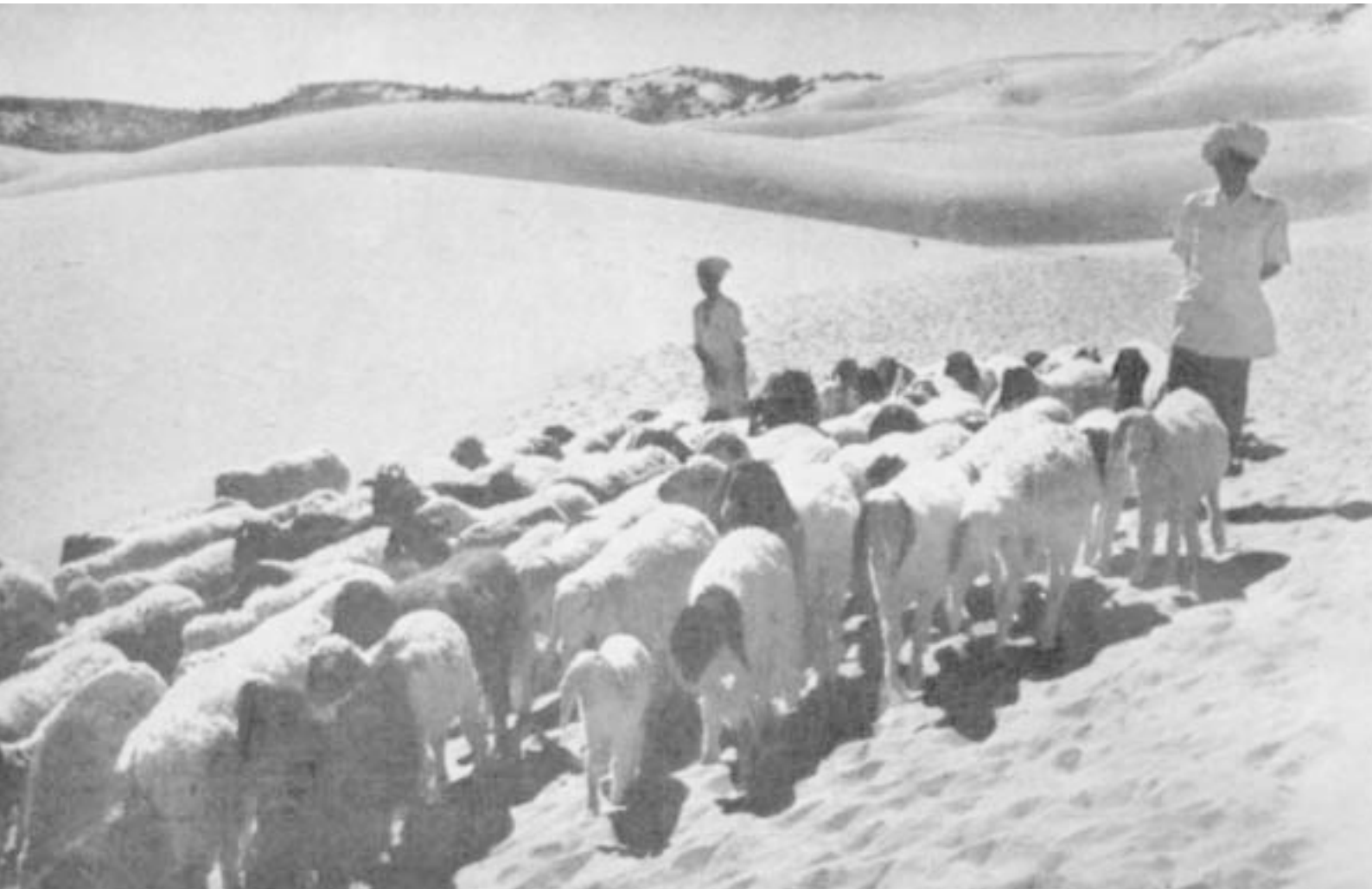
In Jaisalmer Tehsil, half the villages are very small, with less than 500 people living in each one. The villages are also sparsely scattered across dry regions.

## Sheep and Goat Rearing

Villagers in the Thar rear a large number of sheep and goats and sell them for their meat. Their wool is also collected and sold. During the monsoon, even with a little bit of rain, quite a bit of grass springs up in the desert. Especially sevan grass, which is very good fodder for the animals. During the times when water is scarce they also eat thorny bushes and leafy branches from khejdi trees.

In big cities such as Delhi, Mumbai, and Jaipur, the demand for meat is always increasing. The animal-hides are also used for leather, which is one of our country's most important exports. India has the highest total number of cattle, buffaloes, sheep, goats, and pigs of all the countries in the world. Rajasthan and West Bengal produce the most sheep and goats in India. Animal rearing thus remains an important occupation for the people of the desert.

Grazing sheep in Rajasthan





## Crops

Due to the shortage of water very few crops are grown in the Thar Desert. If people somehow or other manage to get a single crop in a year, they consider themselves lucky. In some parts of the Thar, bajra can be sown in the rainy season. It is one crop that can grow in sandy soil without too much water.

*Bajra is ready to harvest three months after it is planted. Look at the graph on page 195 and tell when bajra would be harvested in the area around Jaisalmer.*

After bajra is harvested, the fields lie fallow till the next rains. With just one small bajra crop, it is certainly not possible for a family to manage for the whole year! Hence, people depend a lot on sheep and goat rearing.



## Rainwater Harvesting

During the monsoon people have to make special arrangements to collect rainwater. There will be no other source of water for the rest of the year.

In many houses there are pucca tanks in the middle of the courtyard, to collect rainwater. The rain that falls on the roof of the house is drained straight into the tank. Then, for months this water is used with great care and economy for both the household and the animals. In many places people sit on a charpai to have a bath and the bath water is collected in a vessel placed directly below the charpai. It is used in cleaning the house, and given to the animals to drink. People scrub their utensils with dry sand to clean them - not just to clean them, but to make them shine!

Rainwater also collects in ditches and ponds in the desert. From these small ponds, water seeps into the sand. In order that this seeping water may not be lost, people dig small wells (called kuian or berian) that are 25-30 feet deep, all around the pond. Water seeping from the pond collects in these small wells. Months later, after the water in the ponds has vanished, people can get water from these wells.

Where there are no natural ponds or ditches, people may dig pucca tanks on the lower end of slopes so that the rainwater from all around will collect there.

These arrangements for collecting and storing rainwater are very important because normally in the desert, ground water is found only very deep underground. Thus, it is difficult to get water from wells. Even very deep wells may dry up at times. Also, in some areas well water is saline.

Many villagers have to go many kilometres to get water. In some places women and children have to walk for miles with pots on their heads. In other places water is carried on donkeys or camels.

*What is meant by 'rainwater harvesting'? Can rainwater be 'harvested' like crops are harvested?*

*You read about the arrangements made for saving water in the desert. How do people save water in your area?*

Getting water from a well





# Camels

Camels are very well suited to live in deserts. They can go for many days without drinking water, especially if they get some fresh grass or other green leaves to eat. They are also good at resisting heat.

People need to keep their bodies at a constant temperature all the time. When people get hot, they sweat in order to cool their bodies by evaporation. Thus in hot weather you need to drink more water in order to replenish what you lose through sweat.

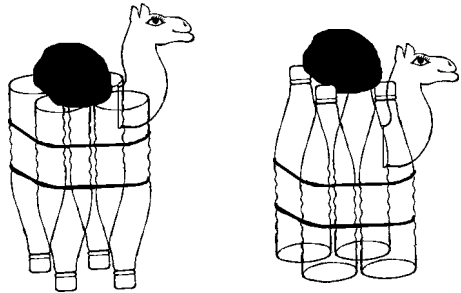
But camels can function at a wide range of body temperatures. Their bodies can go below normal at night and then rise by 6 or 7°C during the day. Thus, they don't need to sweat so much. They also don't lose too much water through urination (their urine is highly concentrated). They can survive even when a lack of water causes them to lose as much as 30% of their body weight. (A person would be on the verge of death after losing only 10% of their weight due to water loss.)

When camels find water, they can drink as much as 100 litres – and they can drink all that in as little as 7 or 8 minutes!

What do they do with so much water? It gets combined with other substances from their fodder to make fat. Much of this fat is stored in their humps. That way the fat also serves as a good insulation from the heat of the sun. As needed, the fat gets broken down to supply the camels with energy and water.

Another thing that makes camels well suited to the desert is their feet. Have you ever tried to run in soft sand? It's difficult because your feet sink deep into the sand at every step. Camels have wide, padded hooves that do not sink too deep in the sand. This, combined with their long legs allows them to move quite fast across the sand. Good camels can walk up to 16 kilometres in an hour on sand.





**Experiment: Why don't camels' hooves sink deep into sand?**

Make two models of camels – one with small pointed feet, and the other with large, flat feet. The models don't have to look exactly like camels – they could look like the ones shown here. Put them on soft, dry sand and see which one sinks in further. (Make sure both models are the same weight.) Then write down what you did, what happened, and why you think it happened the way it did.

## Migrating Shepherds

After the bajra is cut, its stalks are left standing in the fields so that sheep can graze on them. By the end of November the sheep have gotten fat on sevan grass and bajra stalks. They have also grown a lot of wool, especially in years when the monsoon is good.

So everyone gathers their sheep together and gets them sheared. The sheep are washed before shearing and if any thorns are stuck to their wool they are carefully removed. What a lot of work! Still, it is worth the trouble because well-cleaned wool fetches a better price from the traders who go from village to village buying up the wool.

Soon the fodder around the village begins to get scarce. There is not enough vegetation to allow many sheep and goats to graze all year round. What will the animals eat during the winter and the summer? The shepherds get ready to migrate in search of fodder. Migration is an old tradition and the shepherds have fixed routes where they know they will be able to find fodder as they travel from place to place. The map on the next page shows the states that surround Rajasthan. The arrows show the usual migration routes used by the shepherds of Jaisalmer and Bikaner.

Sevan grass

*Which areas of different states do sheep herders visit? Look at the map on the right and tell.*

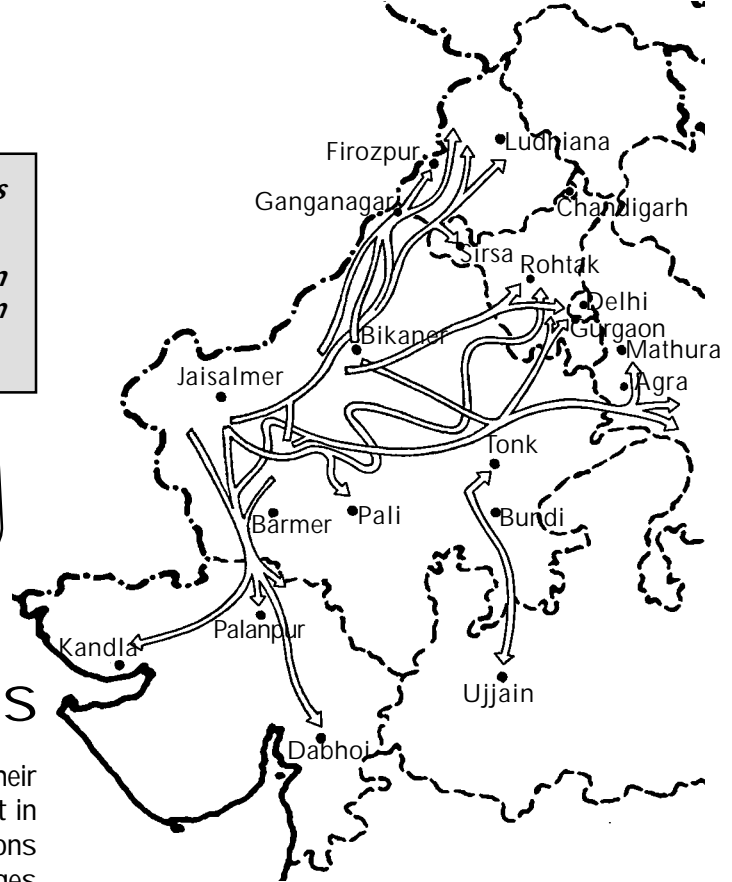
*Why is sheep fodder available for the sheep in these places? How are these areas different from the Thar?*

Come, let's join a group of about 50 shepherds from two villages in Jaisalmer Tehsil, and see what happens as they migrate from place to place, herding sheep.

## A Journey with Some Shepherds

In some parts of Rajasthan people only take their animals out if there is a severe drought. But in our villages, we go every year. One or two persons from almost all the households of both villages are leaving with their sheep and goats. Most of us are men, but a few women and children are also coming. Most of the women, children and elderly people are staying at home.

We are leaving with 6,000 sheep and 22 camels. Some families might have 70-80 sheep, others may have 100-200 sheep and some even have 300 sheep. Those families who have only 40-50



sheep are not going out this year. They will roam over nearby places to graze their sheep.

After many days of preparation, everything has been loaded onto camels and we are ready to begin our long journey. We set off on foot, herding the sheep along as we go. Although the sheep are healthy, they are looking thin only because they were just sheared. They are quite a sight to see - moving along in a huge herd spread across the land.



## Winter Days

The areas to the east get more rain, so that's where we're going. As we go along, we start seeing more grass and more trees of khejdi and babool. We cut small branches from these trees to feed the sheep.

After each day's walk, when evening descends, we pitch camp on a field or anywhere in the open. It's getting cold now. We unload everything from the camels and prepare our food. After a long day's walk, we're all hungry. We light the cooking fires, using some wood we have collected along the way. We make dal and rotis of bajra, and eat them with chillies and onions. Then we settle down in our quilts for a night's sleep.

On getting up in the morning we have tea made with sheep's milk, and then again we have rotis of bajra. After finishing our morning meal, we pack up and set out again on the day's journey.

There is more land under cultivation here in the eastern part of Rajasthan. We graze the sheep on the stalks that are left standing in the bajra fields after the harvest. They provide plentiful fodder.

## The Sheep Have Problems

There are many problems that we have to face on our journey. After having been travelling for almost a month now, the sheep are beginning to tire. In some of the places we passed through, we were not able to get good fodder. Even finding drinking water can be difficult at times. Now it's getting very cold, and the sheep are beginning to fall ill. Our money and supplies are also getting low. Many people are thinking of borrowing money. There's a small town not far from here where there's a wool merchant whom we know. Some people are planning to go to him and borrow some money. Then we'll buy bajra flour, gur and oil from the market. We'll make a



mixture of these things and feed it to the sheep every day. We'll also get whatever medicines they need from the market.

If we don't improve the sheep's diet and give them the medicines in time, they might start dying. It is also very difficult to herd along sick animals over long routes. So we might have to sell off the sick animals along the way. Naturally, we won't get a good price for a sick animal, but at least we'll get some cash. This will help us buy more food and medicine for the other sheep.

## The Aravalli Hills

Two months have passed and still our long walk continues. Now the Aravalli hills can be seen to the east.

In this area many farmers irrigate their fields from tube wells. They grow crops of wheat and gram in winters. Of course we can't graze the sheep in these fields. The animals can be grazed only in those fields that the farmers have left fallow. But the owners do let our animals eat the leaves of the trees growing on the fields. Sometimes, they even pay us to let our sheep graze and roam over unplanted fields. This is because the sheep fertilise their fields with their droppings.

*In your area, do farmers have the animals manure their fields like this? If yes, then how do they repay the shepherds for this service?*





Through all such difficulties, the winter months pass. After 4 or 5 months, the sheep are again thickly covered with wool. Since we are now in mid-journey, far from home, we don't have the time or the equipment to clean the sheep and shear the wool ourselves. So we call some shearers from the town near our camp and pay them to do it.

Wool merchants have shops in every 'kasba' and town along our route. The merchants themselves come to our camp to buy the wool.

The wool sheared at the end of the winter is not much in quantity, nor is it very clean. Therefore it doesn't fetch much of an income. However, we get enough money to repay what we had borrowed for the sheep's food and medicines. We send the remaining money back to our villages since by now our families back home must be running out of grain and must be finding it difficult to manage.

***Why would the family members in the village have to face shortages of grain as winter ends? Explain.***

***Why do the shepherds get more income from monsoon wool than from winter wool?***

## The Summer

The months of March and April arrive. Now we have started heading out of Rajasthan for Haryana. In Haryana irrigation takes place through canals. The rabi crop of wheat is being harvested now. Therefore we are able to find many fields full of stubble (the stalks that remain after harvest), on which the sheep graze to their heart's content.

In Haryana, 'desi babool' also grows aplenty all around. Its leaves and fruits are very good for the sheep. However, we have to take care that the sheep do not end up eating 'vilayati babool' by mistake - this kind is poisonous for sheep.

Throughout April, May and June we continue herding the sheep from place to place in Haryana.

## The Return Journey

Summer is passing. Now the rains are about to come. In Haryana, the fields will soon be ploughed. Preparations will be made for sowing. It won't be possible to graze sheep over here any longer. Anyway, now it's time to return to our desert villages.

During June and July we travel back. This long return journey in hot weather is full of hardships. On all the fields along the way preparations are on for the monsoon sowing. The sheep have to make do with whatever grass and leaves of trees they can find by the roadside. By the time we reach our villages in the desert, it will have rained and they will get fodder - it is with this hope that we keep walking along. If this hope gets dashed and the rains don't come by the time we return, we'll really be in a very dangerous situation - our very survival will be threatened.

Women cleaning wool



# Drought

An example of such a crisis occurred in 1987. The shepherds returned home and there was not a drop of rain. Neither grass nor bajra could grow. The few leaves left on the shrubs were eaten within a few days. Where could they go? The whole of western Rajasthan was under a drought. The shepherds couldn't go back to Haryana - there would be crops standing in the fields there. If they stayed in their villages how would they save the animals from dying? And if the animals died, how would the people survive? Farming was already out of the question.

Do you know what the hundreds of sheep-rearers of the desert did? They borrowed money and hired trucks, loaded their sheep on to the trucks, and headed for the jungles of Madhya Pradesh. That was the only place they could find where their sheep could graze. They had to use trucks to get there because there wasn't enough fodder for the animals to eat along the way.

Thousands and thousands of sheep came to graze in the jungles of M.P. The forest department tried to stop this and they made the sheep-rearers pay heavy fines. As the drought-like situation in Rajasthan continued year after year, the shepherds

decided not to go back home at all for the monsoons. Instead they decided to use the forests of M.P to graze their sheep in the monsoon months. Hundreds of sheep-rearers of the Thar with 15-20 lakh sheep have left their villages forever. They keep moving between eastern Rajasthan, Uttar Pradesh and the jungles and the fields of Madhya Pradesh. They have gone to court against the restrictions and taxes that the forest department imposes upon them.

*List the options the shepherds have during the monsoon months and write the pros and cons of each option.*

*Do the shepherds have the right to use the forest?*

*What harm might the shepherds bring on the forest:-*

- *Would large numbers of trees be cut by them?*
- *Would small saplings planted by the forest department be eaten up by the grazing sheep?*

*What benefits can the sheep bring to the forest?*

*Can a balanced policy be made to protect the forests and the needs of the shepherds? In your opinion, what will it contain?*

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# Sand Dunes

In some parts of the Thar Desert there are vast dunes of shifting sand everywhere. Blown by the swift desert breeze the sand of one dune moves ahead and forms a new dune in a new place. In the absolutely dry summer months there are sand storms as well. Then it becomes difficult to go outside. Sometimes the winds blow the sand great distances, darkening the sky for days even in places as far away as Delhi.

Sand dunes can be seen all around in Jaisalmer, Bikaner, and Ganganagar. The sand dunes and sand storms create great problems for the irrigated agriculture of Ganganagar. The channels that carry water keep getting choked by sand. Sand settles over crops sown in the fields, crushing the smaller plants. Fields may have to be



reploughed and resown a number of times. Sand has to be removed from canals and from the fields many times.

Neither grass nor shrubs can grow on these shifting dunes. Hence they are of no use for grazing. Attempts are being made to plant shrubs on them,

so that the sand is not blown away. Shrubs could also provide fuel wood and fodder for animals.

Shifting sand dunes and sand storms are among the many hardships that the people of this dry region have to endure. There are no easy solutions for such problems.

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## Attempts to Make the Desert Green

There are no rivers in western Rajasthan, but just to the north lies Punjab. In Punjab the Sutlej, Beas, and Ravi, carry plenty of water throughout the year. Much of this water comes from the melting of the Himalayan snow.

In 1958 the Rajasthan Canal Project was taken up in order to build a 649 km long canal to bring water from the Sutlej to the desert of Rajasthan. As a result of this, the northern areas of Rajasthan are now being irrigated, especially in the Ganganagar district. Some areas bordering the canal that had been absolutely dry and sandy are now completely transformed into farmland.

Here, instead of one crop of bajra a year, two crops are taken. Wheat, gram, cotton, jowar, sugar cane, groundnuts, jeera, dhanian, chillies and other crops are now being grown in the desert, thanks to the canal waters.

Earlier there were few people living in Ganganagar District. After the canal was built the government resettled many farmers of Punjab and Haryana there. These farmers were experienced in intensive farming. Many farmers of Rajasthan also adopted intensive irrigated agriculture.

### Problems for the Shepherds

With irrigated farming taking place, the shepherds ran into problems. Sevan grass disappeared. Now crops are standing in the fields year round, and it has become difficult to graze animals. As a result, many people sold off their animals.

### Too Much Water

Then, after a number of years of irrigation, the farmers also had to face a new and serious problem. Irrigating the sandy land resulted in raising the level of ground water. This happened because just 1.5 to 6 metres beneath the surface was a hard layer of limestone. The water from the canals and irrigated fields seeped down and collected on top of this layer of limestone. As the water level rose an area of about 8000 sq km became almost waterlogged and marshy.

### Salination of the Soil

Since the water table rose up the salts found under the ground also dissolved in the water and came close to the surface of the soil. Thus, each year the soil gradually got more and more saline. After a number of years the fields got so saline that crops could no longer be grown. Cultivation had to be abandoned in such fields for many years.

As a result of the problems created by the canal waters, efforts are now being made to grow more of such crops that require less irrigation. Efforts are also being made to adopt irrigation techniques that do not waste as much water as happens when water flows through long channels to reach the crops. Attempts have been made to lay pipelines in fields and use sprinklers that enable water to reach the roots of the crops directly.

Many people suggest that instead of increasing irrigated farming in the desert, raising animals should be encouraged. Irrigation water could be used to grow grasses, and shrubs rather than crops. Since less water would be required, water logging and salinity would be reduced.



# Exercises

1. Use your Atlas to answer the following questions:
  - a) Find three cities or towns that are in the Thar Desert.
  - b) Is the Thar Desert at the same elevation as most of the Ganga River Basin?
  - c) Is the Thar Desert at a higher or lower elevation compared to Ajmer and Udaipur?
  - d) According to the map in your Atlas, what is the average temperature in January in Bikaner?
2. How does water scarcity affect the lives of people in the desert? Explain.
3. Compare the eastern and western regions of Rajasthan. Mention differences and similarities in land, water, vegetation, agriculture and the life of people.
4. The people of the desert depend more on rainwater than on ground water. Why?
5. What kind of fodder do the sheep get in the monsoon, in the summer and in the winter?
6. When is the wool of the sheep sheared? How is the wool sold?
7. Why do the shepherds have to take loans?
8. If you were a shepherd in the Thar, what would you think if you heard the government was planning to build a canal near your village? Explain in detail.
9. What are three advantages and three disadvantages of introducing irrigated farming in the desert?
10. Look at the Table below and tell which kinds of animals are the second most important source of meat in India.

## **Meat and Poultry Produced in India (1995)**

<b><u>Source</u></b>	<b><u>Percent of total meat products</u></b>
Cattle and buffaloes	40%
Sheep and goats	26%
Pigs	16%
Poultry (mainly chicken)	16%
Others	2%

(Source of data: National School Atlas, Department of Science and Technology, Government of India, 1999)



A man weaving with goat hair